FIFTEENTH ANNUAL MEETING

TRANSACTIONS OF THE

Western Surgical and Gynecological Association

Fifteenth Annual Meeting, held at Kansas City, Mo., December, 1905

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OFFICERS AND EXECUTIVE COUNCIL, 1906

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WILLIAM W. GRANT - - - Denver, Colo.

3761

EX-PRESIDENTS AND MEETING PLACES

PRESIDENT	PLACE	YEAR
S. S. Todd*	Topeka	1891
Milo B. Ward*	Kansas City	1892
Milo B. Ward*	Des Moines	1893
Lewis Schooler	Omaha	1894
John E. Summers, Jr.	Kansas City	1895
T. J. Beattie*	Topeka	1896
Joseph Eastman*	Denver	1897
David S. Fairchild	Omaha	1898
Homer C. Crowell	Des Moines	1899
O. Beverley Campbell	Minneapolis	1900
August F. Jonas	Chicago	1901
James E. Moore	St. Joseph, Mo	1902
Alex. Hugh Ferguson	Denver	1903
Charles H. Mayo	Rochester, Minn.	1904
Harry D. Niles	Salt Lake City	1905

*Deceased.

The Western Surgical and Gynecological Association does not hold itself responsible for, or necessarily endorse, any of the papers printed herein.

ARTHUR T. MANN, Secretary-Treas.

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Executive Session

December 28—First Day—Morning Session

The Association convened at the Midland Hotel, and was called to order at 9:25 A. M. by Dr. H. C. Crowell, chairman of the local committee of arrangements, who, on behalf of the committee, said:

It has been deemed expedient by the committee of arrangements that the usual address of welcome by the Mayor be dispensed with as being an unnecessary consumption of time; and the program, as you will have realized already by looking it over, is very voluminous, and will take all the time we have at our command. Knowing you as I do personally, I do not think it necessary to advert to the fact that we shall in any way become responsible for your acts that may result from injudicious or sudden change of diet or atmospheric changes. We shall simply advise you to be cautious in regard to the taking of bad money (laughter), and we would advert also to the fact that newly formed associates should be carefully scrutinized. (Applause.)

We will at once proceed with the scientific program.

The President, Dr. H. D. Niles, of Salt Lake City, now took the chair.

The first paper read was by Dr. Chas. E. Bowers, of Wichita, Kansas, entitled "The Transvesical Operation for the Relief of Prostatism in Aged Males." The paper was discussed by Drs. Byford, Moore, Grant, Andrews, Harris, and the discussion was closed by the essayist.

Dr. D. W. Basham, of Wichita, Kansas, read a paper entitled "Some Observations on Renal Surgery."

It was discussed by Drs. Abbott, Jepson, Oviatt, Benjamin, and, in closing, by the essayist.

Dr. W. W. Grant, of Denver, Colorado, followed with a paper on "Cancer of the Colon," and the same was discussed by Drs. Andrews, Perkins, Abbott, and Summers, and the discussion was closed by the author.

Dr. H. G. Wetherill, of Denver, Colorado, read a paper on "The Choice of Ligatures and Suture Material for Abdominal Surgery," discussed by Drs. Bartlett, Hertzler, Pearse, Binnie, Connell, and, in closing, by the essayist.

Dr. Jabez N. Jackson, of Kansas City, Mo., read a paper entitled "A New Technic for Breast Amputation." This was discussed by Dr. Powers and, in closing, by the essayist.

On motion of the Secretary, a paper by Dr. Beverly MacMonagle, of San Francisco, California, entitled "Can the Results of Cancer of the Breast be Improved?" was read by title.

On motion the Association adjourned until 1:30 P. M.

First Day—Afternoon Session

The Association reassembled, pursuant to adjournment, and was called to order by the President.

Dr. W. D. Haines, of Cincinnati, Ohio, read a paper on "Fractures About the Elbow Joint," which was discussed by Drs. Lord, Summers, Benjamin, Mayo, Jones, Porter, Baldwin, and, in closing, by the essayist.

Dr. A. F. Jonas, of Omaha, Nebraska, read a paper entitled "A Plastic Operation for the Permanent Relief of Cicatricial Talipes Calcaneus."

Dr. T. E. Potter, of St. Joseph, Missouri, read a paper on "Tubercular Peritonitis."

Dr. Miles F. Porter, of Fort Wayne, Indiana, read a paper entitled "Chylous Cysts of the Mesentery."

Dr. Donald Macrae, of Council Bluffs, Iowa, read a paper on "Treatment of General Peritonitis."

Dr. Wm. Jepson, of Sioux City, Iowa, followed with a paper on "Drainage of the Male Pelvis."

These four papers were discussed jointly by Drs. Abbott, Mayo, Davis, Knott, Andrews, Perkins, and Harris, and the discussion closed by Drs. Potter, Macrae, and Jepson.

Dr. I. B. Perkins, of Denver, Colorado, read the first paper of a symposium entitled "Appendicitis, with Further Reports from Physicians Who Have Suffered from the Disease."

Dr. O. Beverly Campbell, of St. Joseph, Mo., read a paper entitled "The Treatment of Appendicitis."

Dr. Van Buren Knott, of Sioux City, Iowa, read a paper entitled "Ideas Concerning the Management of Appendicitis, Based upon One Thousand Operations."

Dr. C. H. Wallace, of St. Joseph, Mo., read a paper entitled "Treatment of Appendicitis in the Various Stages as It Comes to the Surgeon."

On motion, the discussion of this symposium was postponed until 9 o'clock Friday morning.

On motion the Association adjourned until 9 A. M., Friday.

At the banquet, President Niles delivered his address, entitled "Twentieth Century Surgical Problems."

DECEMBER 29—SECOND DAY—MORNING SESSION

The Association met at 9:15 A. M., with the President in the chair.

The first order was the discussion of the symposium on appendicitis, which was opened by Dr. Moore, and continued by Drs. Andrews, Potter, Niles, Schooler, Cordier, Grant, Pearse, and Powers, and the discussion closed by Drs. Perkins, Campbell, Knott and Wallace.

Dr. J. W. Andrews, of Mankato, Minn., read a paper on "Extra-uterine Pregnancy, with Report of a Case."

Dr. A. L. Wright, of Carroll, Iowa, read a paper

on "Post-Climacteric Hemorrhages: Their Cause and Treatment."

These two papers were discussed by Drs. Davis, Fairchild, Campbell, Wetherill, Ground, Percy, and Abbott, and the discussion closed by Dr. Wright.

Dr. J. N. Warren, of Sioux City, Iowa, read a paper on "Gunshot Wounds of the Stomach," after which the Association adjourned until 1:30 P. M.

THIRD DAY—AFTERNOON SESSION

The Association reassembled, pursuant to adjournment, and was called to order by the President.

Dr. F. Gregory Connell, of Salida, Colorado, read a paper entitled "A Free Interval in Meningeal Hemorrhage." The paper was discussed by Drs. Jepson, Sala, Baldwin and Mann.

Dr. Charles H. Mayo, of Rochester, Minnesota, read a paper on "The Surgical Treatment of Varicose Veins."

Dr. S. C. Baldwin, of Salt Lake City, Utah, followed with a paper entitled "The Symptoms of Spinal Disease," and the same was discussed by Dr. Moore.

Dr. William E. Ground, of Superior, Wisconsin, read a paper entitled "Gastric Dyspepsias Amenable to Surgical Treatment," discussed by Dr. Andrews and, in closing, by Dr. Ground.

The Secretary presented the following report on behalf of the Executive Council:

REPORT OF THE EXECUTIVE COUNCIL

Kansas City, Mo., December 28, 1905.
6:30 P. M.

There were present at the meeting of the Executive Council Drs. Mayo, Moore, Oviatt, and Wallace.

In the absence of Dr. Ferguson, Dr. W. W. Grant, of Denver, was appointed to fill his place at this meeting.

The minutes of previous meeting were approved.

The Treasurer's report was read as follows:

TREASURER'S REPORT

RECEIPTS

Balance in treasury, Dec. 28, 1904	$628.16
Fees and dues received during the year	680.00
Refund for illustrations in transactions	28.50
One copy transactions	1.00
	$1,337.66

DISBURSEMENTS

Paid H. A. Sifton, Milwaukee banquet	$75.00
Paid Wm. Whitford for reporting Milwaukee meeting	121.68
Paid B. B. Davis, honorarium as secretary	100.00
Paid for stationery, printing, etc	38.75
Paid Jour. A. M. A. for printing transactions	480.15
Paid for postage, express, exchange, etc	12.50
Balance in treasury, Dec. 28, 1905	509.58
Total	$1,337.66

On motion $75.00 was appropriated for the local committee to assist in defraying their expenses, and $100.00 was appropriated as the usual honorarium of the Secretary.

It was moved and seconded that the next meeting be held in St. Louis.

Carried.

The following amendments to the By-Laws were proposed by Dr. J. E. Moore, and laid on the table for action at the next annual meeting: To change Section 7, to make the annual dues $10.00 instead of $5.00, as at present, and that the Association hereafter pay for the banquet; also that all non-members be required to pay $5.00 for a ticket to the banquet.

The following were recommended for membership:

Willard Bartlett, St. Louis, Mo.
John C. Morfit, St. Louis, Mo.
Harvey G. Mudd, St. Louis, Mo.
Joseph Rilus Eastman, Indianapolis, Ind.
Palmer Findley, Chicago, Ill.
William E. Rochford, Minneapolis, Minn.
John C. Hancock, Dubuque, Iowa.

Peter H. Jobse, Milwaukee, Wis.
A. H. Levings, Milwaukee, Wis.
Howard Hill, Kansas City, Mo.
W. J. Frick, Kansas City, Mo.

The following are recommended for officers for the ensuing year:

President, Dr. Malcolm L. Harris, Chicago, Ill.

First Vice-President, Dr. A. L. Wright, Carroll, Iowa.

Second Vice-President, Dr. C. Lester Hall, Kansas City, Mo.

Secretary-Treasurer, Dr. Arthur T. Mann, Minneapolis, Minn.

Members of Executive Council: Dr. W. W. Grant, Denver, Colo., and Dr. C. H. Wallace, St. Joseph, Mo.

Before action was taken on the report of the Executive Council, Dr. S. C. Baldwin arose and asked leave to extend an invitation to the Association to hold its next annual meeting in Salt Lake City.

Dr. John P. Lord, of Omaha, moved the adoption of that part of the report pertaining to the place of meeting Seconded.

Dr. D. S. Fairchild, of Des Moines, moved that Salt Lake City be substituted for St. Louis as the next place of meeting.

The substitute was seconded, and carried.

Dr. J. N. Warren, of Sioux City, Iowa, moved that the report of the Committee as it pertained to the nomination of officers be adopted, and that the Secretary be instructed to cast the ballot for the men nominated by the Executive Board.

This motion was seconded and carried.

The Secretary then, in accordance with instructions, cast the unanimous ballot of the Association for the officers mentioned, and they were declared duly elected.

On motion the recommendation of the Executive

Council as regards new members was concurred in.

Dr. Fairchild thereupon moved, the motion being duly seconded, that the report of the Executive Council be adopted as a whole. Carried.

Dr. Joseph Rilus Eastman, of Indianapolis, Indiana, then read a paper on "The Effect of Osmic Acid Injections," which was discussed by Drs. Hertzler, Jackson, Haines, Fairchild, and, in closing, by the essayist.

Dr. Howard Hill, of Kansas City, Mo., read a paper on "Restoration of the Perineum," which was discussed by Drs. Abbott, Byford, and, in closing, by Dr. Hill.

Dr. J. E. Summers, Jr., of Omaha, Neb., read a paper entitled "Report of a Case of Gluteal Cavernous Angioma."

Dr. A. W. Abbott, of Minneapolis, Minnesota, read a paper on "Pre-Operative Thrombi in the Region of the Field of Operation as a Cause of Post-Operative Complications and Death." This paper was discussed by Dr. Byford and, in closing, by the essayist.

Dr. S. C. Beede, of David City, Neb., read a paper entitled "Conservatism in Post-Operative Treatment."

Dr. A. E. Benjamin, of Minneapolis, Minn., read a paper entitled "Undescended Testicle," and the same was discussed by Drs. Eastman and Benjamin.

A vote of thanks extended to the Committee of Arrangements for the manner in which they contributed toward the success of the meeting brought the proceedings to a close.

On motion the Association adjourned, to meet in Salt Lake City, December, 1906.

ARTHUR T. MANN, Secretary.

Note.—The date of meeting was later changed by the Executive Council to August 30th.

President's Address

TWENTIETH CENTURY SURGICAL PROBLEMS

H. D. NILES, M. D.

SALT LAKE CITY, UTAH

No thoughtful student of medicine can fail to be profoundly impressed with the surgical work and achievements of the past century. Revolutionizing discoveries have been made, new principles established, and perfected methods of procedure evolved in such rapid succession that we who stand just within the threshold of the twentieth century, contemplating with wonder and gratitude the triumphs of the past and trying to formulate plans for the future, may feel that there is little remaining for us to do in hastening the progress of surgery. But if we rightly construe the lessons taught by the work and workers of the past, we shall not long remain unmindful of the responsibilities and opportunities of the present, for they reveal, more or less distinctly, the great undeveloped possibilities of surgery that await the solution of problems which we, and those who follow us, must strive to solve, one by one, until that time shall come when there is no mortality or suffering from surgical disease. I trust that on this occasion we may find ourselves in sympathy with the thoughts suggested by these lessons of the past, and interested to consider those surgical problems that confront us to-day, for, if we are to do our part toward the advancement of surgery, we must seek the elements of future success in the study of present failures.

It seems to be the tendency of modern surgery to magnify the importance of manners and methods, and at times to forget that all our real advances and substantial achievements depend, now as always, not upon our inventing or blindly imitating new plans of procedure, but upon our alertness in diagnosis and our faithful allegiance to sound surgical principles as they are gradually developed from our growing knowlege of anatomy, physiology, and pathology.

No one who has kept in touch with our recent experiences in the surgery of the brain, lungs, pancreas, spleen, peritoneum, and other organs, can escape the conviction that with a clear definite idea of the physiology of these parts, the result of our surgical endeavors would be infinitely more satisfactory than we are able to obtain with our present knowledge. In brain surgery our many failures cannot be charged to any lack of operative skill, but to our inability to accurately locate the exact pathology early enough to insure its safe removal or correction.

The same may be said of the morbid conditions of the spleen, pancreas, and, in a degree, of the stomach. Until we are better informed by the physiologist of the normal functions of these organs, we cannot hope always to differentiate between the normal and the abnormal. The evidence that points to the one and excludes the other, can come to us only through concentrated specialized efforts which the average surgeon is technically unfitted to undertake.

We have been taught to believe that the normal mobility of the gastro-intestinal canal and the pelvic organs, is essential to the healthful performance of their physiological functions. But we need to know more of the anatomy, physiology, and pathology of these parts, if we are to take into stricter account the disturbances, distresses, and diseases that may follow when they are immobilized by inflammatory lesions, pressure of tumors, or surgical operations. We need

to know more of the phagocytic, absorptive, and reparative powers of the peritoneum and other tissues of the body. In obtaining this knowledge, clinical observations and the testimony of patients may be helpful, but our most convincing evidence must be based upon special experimentation in our laboratories, to be afterward tested in actual practice.

The line that divides surgical diseases from non-surgical is still somewhat vague and indistinct, and one of our most common sources of error in treatment arises from the fact that we are often in doubt as to when and how far we may safely trust to the reparative resources of nature, and under what conditions we should resort to prompt operative interference. We know that many morbid conditions may yield more or less perfectly to nature's reparative powers; and we have learned of other morbid conditions that cannot be modified, corrected, or removed except by mechanical means. But until the line that divides the limitations of rational medicine from the boundaries of surgery is more clearly defined, the internist and the surgeon will often encroach upon each other's proper field, and the best endeavors of both will fail to produce the most satisfactory results. To establish this line, we must again seek assistance from the physiologist and the pathologist, for we need not only to know more of the functions of the different tissues of the body in health, but we must become better acquainted with the reparative, absorptive, and phagocytic powers of these tissues in the presence of the various pathologic processes and in the different stages of the disease. Even this is not enough, for theories evolved in the laboratory or dead-house, however suggestive or plausible they may appear, have no established practical value until their real worth is determined when the crucial test is applied at the bedside or upon the operating-table in the presence

of physicians and surgeons competent to pass judgment upon their merit.

Those who fairly consider the mortality and suffering that attend those diseases associated with pathologic processes which we cannot as yet positively determine or rationally treat, because of our lack of knowledge of physiology and pathology, must feel that the profession of the twentieth century has a wide field worthy of their highest endeavors. For example, epilepsy, glaucoma, and exophthalmic goitre annually ruin the lives and happiness of many human beings, and until the mysterious causes of all these afflictions, and the means for correcting them, are made known, we surely have an ample incentive to continue our studies.

We have learned how to render patients immune from the effects of certain pathogenic microbes and their toxines, but so long as tubercle bacilli, typhoid bacilli, and the pyogenic bacteria elude our efforts, there will still remain an incomplete chapter in the progress of medicine which only the physiologist and the pathologist can favorably conclude.

We hear much of preventive medicine and little of preventive surgery. The triumphs of the former are heralded by the internist with justifiable pride. The failures of the latter, the surgeon has frequent occasion to confess with humiliation. Every too-late operation is a painful reminder of our sacred duty to prevent the possible and probable progress of a pathologic process by every means in our power, even to the employment of preventive surgery, for here preventive surgery is timely surgery.

Thus far our success in surgery has been measured largely by our ability to cope with advanced disease after it has become an immediate menace to life and health. But the time cannot be far distant when the importance of recognizing the antecedent pathology of cancer, ulcer, surgical kidney, pus tubes,

prostatitis, and many other grave lesions, will be impressed upon the profession, and the public will be educated to choose "preventive" rather than "last-resort" surgery.

Non-malignant inflammatory lesions and incomplete obstructive twists of the sigmoid, are the causes of much suffering, and of not a few deaths that we may hope to avert when we learn to regard surgical pathology here, as in other constricted parts of the alimentary canal. This is a comparatively new and certainly worthy field of study that invites the attention of the surgeons of to-day.

Our present failures to interrupt the progress of inflammatory lesions, while they are yet safely accessible and before they reach dangerous stages or regions, are responsible for a large proportion of the suffering and mortality of our operative procedures. Every case of appendiceal abscess, pyosalpinx, cancer of the stomach, malignant disease of the sigmoid, mastoid disease, or surgical kidney, should bring to the mind of the medical attendant, as well as of the operator, a mental picture of the antecedent pathology, and serve to strengthen their determination to seek out means for recognizing it early enough to exclude the dangers of a late operation upon a resultant pathology.

Every poor, unfortunate creature we meet upon the street who is crippled or deformed by the ravages of tubercular disease, is a mute but pathetic appeal to our profession to advance preventive surgery until mankind is free from this most prolific source of misery and unhappiness.

I have briefly referred to a few of the many problems that, in the progress of surgery, confront us to-day, and are awaiting solution.

As we take these problems into thoughtful account and appreciate the causes of our present failures, we are forced to conclude that to-day, and always, our

great advances in surgery can come only from a clearer comprehension of those laws of nature that govern human life and vital processes in health and disease, and that the anatomist, the physiologist, and the pathologist are destined to remain the most potential factors in progressive surgery. But it is equally true that, so long as a large proportion of these scientific workers are permitted to limit their best endeavors to the teaching of students and the filling of subordinate positions in hospitals, they can never fully meet their highest obligations to surgery. And so long as physicians and surgeons are compelled to rely upon their own college-acquired knowledge of anatomy, physiology, and pathology, we cannot reasonably expect to make much progress in original scientific research, or much headway in solving the problems that confront us to-day.

The very nature of these problems and their vital importance demand that we surgeons should press into more active and general service, and bring into more intimate association the anatomist, physiologist, pathologist, and internist.

This is distinctly an age when combinations of special forces rule the world, control all its enterprises, and govern the destiny of every undertaking of any magnitude. In surgery there is a greater need than ever before for an exhibition of this same progressive spirit of the times. We must combine our forces if we are to meet the necessities of the newly existing conditions. Single handed, no surgeon can hope to accomplish much in the face of the peculiar conditions of to-day.

At present the various laboratory workers are undoubtedly inclined to attach too much importance to theoretical conclusions, which may not be applied to advantage in practice, while the operator is unquestionably prone to have an exaggerated idea of the lessons taught in the operating-room. The internist, on

the other hand, is often placed in the embarrassing position of accepting the teaching of both, while at the same time he strives to please his patients, and preserve his own self-respect.

All these workers should be brought into the closest possible relations, and in practice, as well as in theory, they should learn to regard pathologic processes and their rational treatment from the same point of view. The surgeon and the internist certainly have need to harmonize and perfect their ideas of pathology and treatment by a more intimate association in their daily work than is usual or often possible under existing conditions. In this way the internist would often see, and become familiar with, a pathology as revealed upon the operating-table, which in his consulting-room or library he could only picture imperfectly, and might be tempted to treat symptomatically.

The surgeon should find time and opportunity to study at the bedside the earlier symptoms of surgical diseases when the indications are most obscure. He needs to know more of the trials, difficulties, and doubts of his colleagues, if he is to be kindly in his judgment, and he has abundant reason to familiarize himself with the symptoms of pathology in every stage, if he is to decide questions pertaining to "rational" and "timely" treatment.

The laboratory worker should no longer rely exclusively upon the miscroscope to furnish him with the best and broadest views, or trust alone to scientific experimentation to give him the most practical conception of disease. He too needs to often see and study morbid conditions in life, and to know well the symptoms, suffering, and danger they produce, if he is to impart the most practical knowledge to students, or to become the most helpful associate of surgeons; for it is not in our laboratories, but in our consulting-rooms, at the sick bed, and at the operating-table that we have the greatest need to know more of pathology,

and are inspired with the strongest determination to study all those factors that have to do with the deviation from and restoration of health.

If we are ever to solve the problems that baffle our endeavors to-day, and place surgery upon a much higher plane than it now occupies, our scientific workers must become more practical, our practical workers must become more scientific, and our physicians and surgeons must become more nearly united in their ideas of pathology and treatment. And this can be accomplished only by an organized movement tending to bring all workers into closer touch and sympathy with each other.

Such a combination of forces as I have outlined can be organized and made effective in every community capable of supporting a hospital and a medical society. And in this cause our hospitals should be willing and desirous to meet our needs, for in doing so they would in time fulfill their highest mission of usefulness by developing a great system of scientific institutions distributed throughout the world, where not only the sick and afflicted would be kindly and skillfully attended, but where earnest, experienced men of mature judgment might meet, study and work harmoniously together in their efforts to solve those problems that have to do with the prevention of disease, the mitigation of suffering, and the saving of life.

But if we are to secure the full benefits to be derived from our hospitals and from our colleagues, the internist and the laboratory workers, we must do our part. The medical profession must either own their own hospitals, or they must prove to hospital governments or hospital benefactors that our cause is a worthy one, and that with their help we can and will make our hospitals a greater blessing to mankind than is possible under the present system. We must learn to realize that every laborer is worthy of his hire, and that, until the recompense of the laboratory worker

is proportionate to that of the physician and surgeon, the laboratory will not attract its proportion of good men. We must see to it that this work and these opportunities be not restricted to the favored few who happen to be on hospital staffs. We need the united support and help of every member of the whole profession, and every reputable graduate of medicine should be invited, encouraged, and urged to begin early his post-graduate studies and researches, and to continue them throughout his active life, by participating in the educational and other advantages to be offered by those institutions.

These and many other questions which arise in this connection, can and should be discussed in detail among ourselves, in our societies, and by our medical journals; but we may be assured that in due time they can all be settled satisfactorily, if we approach them in a spirit of fairness and good faith.

The workers of the past century had their duties, responsibilities, and opportunities; we have ours. They had their means and methods for advancing surgery; we must formulate ours to meet existing conditions. They overcame their difficulties and achieved their triumphs; we will strive to do likewise; and when this Association shall hold its regular annual meeting a hundred years hence, and a new and brighter chapter in the history of surgery is read, let us hope that that chapter may not be made up of a long list of brilliant operative procedures made possible by easily acquired methods, but, rather, let us trust it may record the coming of many substantial blessings and benefits to mankind through the earnest, systematized, and united efforts of the men of the twentieth century.

THE TRANSVESICAL OPERATION FOR THE RELIEF OF PROSTATISM IN THE AGED MALE

CHARLES E. BOWERS, M. D.

WICHITA, KANSAS

The deductions made and the conclusions drawn in this communication are based upon a recent experience in twelve consecutive cases of senile prostatism.

Morbid senile changes in and about the neck of the bladder may be inflammatory, hypertrophic, or atrophic in character, producing an obstruction to the urinary vesical outlet, which is made manifest by a particular train of symptoms in urgent, frequent, and tenesmic attempts at urination, with partial or complete retention. To this the name of *prostatism* has been applied.

Then, if this be the accepted term, a diagnosis of prostatism is readily made without error from subjective symptoms alone, but to determine in a given case the etiology and gross morbid anatomy may baffle the most skilled diagnostician. It is true that digital examination per rectum will assist in determining the size of the prostate, but the fact that only 30 per cent of individuals with enlarged prostates suffer from prostatism, raises the question whether the hypertrophied prostate alone is the etiologic factor. With the use of steel sounds and the cystoscope additional information can be obtained; but in a large number of cases the obstruction and irritation are so great that it is impossible to make use of these instruments, and, in many instances, when used, the symptoms are temporarily if not permanently exaggerated, and conse-

quently we have discontinued urethral instrumentation for diagnostic purposes in all cases that have run the gauntlet of palliative treatment without results.

Further, the development of a third lobe or prostatic bar will produce obstruction to the urinary outlet; and, again, contracture of the vesical neck will do the same thing. And that clinician who attempts to differentiate by digital examination or urethral instrumentation will, upon a suprapubic exposure of this territory, meet with many surprises should his experience be a repetition of ours.

Chas. H. Chetwood, in the April issue of the Annals of Surgery of the present year, recites a series of mistaken diagnoses (by clever clinicians) conclusively confirmed in suprapubic exposure. We are struck with the notion that most of the writers and surgeons of this country and abroad have confounded contracture of the neck of the bladder and hypertrophy of the prostate. This distinction is vital to the surgeon, as well as to the patient, for upon it depends a rational operative procedure.

Contracture of the neck of the bladder without prostatic hypertrophy is capable of producing, and does produce, prostatism, resulting in morbid conditions in the upper urinary tracts, and in the termination of life if not relieved. Contracture of the neck of the bladder and hypertrophy of the prostate gland may coexist, and failure to detect this fact and remedy this condition will result in a continuation of the symptoms and progress of the malady.

Writers are at variance as to the frequency of prostatic hypertrophy; some estimate that 34 per cent and others 79 per cent of all males who reach the age of sixty are thus possessed, yet all agree that only 15 per cent of these who reach this age are sufferers from prostatism.

A chronic posterior urethritis may cause a true contracture of the neck of the bladder with increased ele-

vation of the urethral orifice, accompanied by all the symptoms of prostatism; and this may account for the above discrepancy.

After acquainting ourselves with the reported cases, operated upon by surgeons of reputation, who in no way have made this distinction, we are constrained to believe that contracture of the neck of the bladder and prostatic hypertrophy have been confused, and operated upon and reported as the latter. The former is so common in later life that it might well be classed with arcus senilis and arteriosclerosis as one of the evidences of that blast accompanying declining years.

The most noted anatomical changes associated with prostatism are (a) bulging of the posterior surface of the prostate gland; (b) hyperplasia of the posterior commissure; (c) lengthening and distortion of the prostatic urethra (sclerosis of the prostate), and (d) contracture of the neck of the bladder. The condition last named was present in a majority of our cases to a great or less degree. The above named anatomical changes are responsible for the fate of the prostatic, i. e., retention, congestion, and inflammation.

Some important anatomical conditions are to be studied in the solution of this surgical question. The prostate gland is composed of two lateral lobes, united by a posterior and an anterior commissure, in which the prostatic urethra is enveloped. The third or middle lobe, prostatic bar and contracture of the neck of the bladder, can be classed together as pathologic in character. This gland is surrounded by a capsule, and held in suspension by the rectovesical fascia, which covers all but the vesical surface of the gland, and is known as its fibrous sheath. In the meshes of this sheath are to be found the venous plexus, arteries, nerves, and lymphatics. Thus it is apparent that an approach to the prostate gland by the transvesical route for the purpose of its enucleation, or any other surgical procedure, can be accomplished without dam-

age to these important systems,—arterial, venous, nervous, and lymphatic.

The true sphincter of the bladder is its external sphincter, which is composed of voluntary muscles and is situated at the junction of the prostate and membranous urethra, just posterior to the deep layer of the triangular ligament.

Any infrapubic attempt at surgery of the prostate is liable to do permanent injury to the true vesical sphincter, and also to the vascular and nervous systems in this region, and this, in one way, may account for the distressing sequelæ incident to this operation, i. e., incontinence, impotence, and urinary and rectal fistulæ, epididymitis, etc.

Our recent experience with the suprapubic operation in 12 cases has yielded the results for which the operation was undertaken: relief of prostatic symptoms, ability to empty the bladder per urethram without pain, and the termination of the cystitis without mortality or sequelæ.

We here submit a brief report of four cases, one each of the different types encountered.

Case 938.—A man aged 70; came into our service in St. Francis Hospital complaining of all the symptoms of prostatism in the most exaggerated degree,—urine contained pus, albumin, blood, and hyaline and granular casts. The daily quantity of urine voided was from 11 to 17 ounces; bladder capacity two and one-half ounces. Digital examination per rectum did not reveal much enlargement of the prostate.

He had lived a catheter life more or less for the past three years, and had sojourned at different times at Hot Springs, Ark., and various other watering resorts in pursuit of relief, but to no avail. His physical condition was much reduced; he could not rest or sleep owing to the constant desire and painful efforts to empty the bladder. With failing heart, body, and mind we feared his ability to stand a prostatectomy,

and decided upon a suprapubic cystotomy as a temporary operation, and a prostatectomy later if he survived the first, and his physical and mental condition should improve sufficiently to warrant it.

On March 15, 1905, under chloroform anesthesia a suprapubic cystotomy was made. The vesical outlet was found to be elevated and contracted, and the posterior commissure comprised a thick band of fibrous connective tissue. This band was severed, and digital divulsion of the prostatic urethra and true sphincter was done, which then lowered the vesical outlet to the apex of the bas-fond, and suprapubic drainage was established. Recovery uneventful.

Discharged from hospital, April 29, 1905. Suprapubic opening closed, and he voided his urine per urethram without pain. Bladder capacity 12 ounces. Subsequent report on November 15, 1905: "No return of former condition."

CASE 1121.—Man, aged 69; came into our service at St. Francis Hospital Oct. 20, 1905, complaining of all the symptoms of prostatism; he had been living a catheter life for nearly two years. Digital examination per rectum revealed a hard atrophic prostate; bladder capacity 4 ounces; urine contained pus, albumin, and hyaline casts; physical condition good.

Under chloroform anesthesia on Oct. 21, 1905, the vesical outlet was exposed through a suprapubic incision, and was found to be elevated and contracted. The prostate was small but elongated and densely hard; urethra penetrated its center. The posterior commissure was incised down to the apex of the bas-fond. The portions of the tissue removed by piecemeal did not appear to contain any granular substance. An attempt to separate the gland from its capsule was seemingly impossible. Dilatation of the prostatic urethra was made, and suprapubic drainage established. Some urine passed per urethram on the 11th day, and practically all on the 35th day.

CASE 1127.—Man, aged 65; came into our service at St. Francis Hospital, suffering from complete urinary retention. His physician had been emptying the bladder with a catheter two or three times daily for four days, but failed in every attempt on Nov. 5, 1905, and immediately brought him to the hospital. He had repeated attacks of cystitis with retention during the last five years, but always got relief by catheterization. The attacks were coming closer together, and during the last year he suffered almost constantly from frequent and painful urination. When seen in St. Francis Hospital, Nov. 5, 1905, at 8 P. M., he was suffering intense pain from an enormously distended bladder.

We were unsuccessful in the attempt at the introduction of a catheter. An anesthetic was at once administered; suprapubic exposure of the neck of the bladder revealed a contracture of its neck and an enlargement of the lateral lobes of the prostate. The constricting fibrous band was incised, prostatic urethra digitally divulsed, and the lateral lobes enucleated; not followed with shock. He was able to leave his bed and walk about the room the next day. Some urine passed per urethram the 9th day. His recovery was interrupted at times by an inability to void the urine per urethram for a day or two, and then he would have no trouble for several days. When he left the hospital on the 41st day the suprapubic wound had closed, and he passed his urine per urethram normally.

CASE 1135.—Man, aged 81; came into our service in St. Francis Hospital, Nov. 10, 1905. He had been suffering from prostatic symptoms for two weeks, slight in the beginning but rapidly progressive in character, and when seen in the hospital he had total obstruction.

With difficulty a small catheter, No. 9, was introduced, and the bladder emptied and irrigated with a 1 per cent carbolic solution. Instructions were given

to immediately prepare him for a suprapubic operation. However, four years prior, this patient came into our service after having suffered from vesical obstruction for five years, with partial and complete retention at times; always relieved with catheter, except in the last attack, when his physician twice resorted to suprapubic puncture. At this time his physical condition was such that we decided to do a suprapubic cystotomy, and establish drainage for temporary relief, and later do a perineal prostatectomy, when the thermal reaction had subsided and his physical and mental condition would warrant the attempt. In about 30 days he was voiding his urine normally and without pain. He begged us to defer the operation until obstructive symptoms reappeared. To this we consented, and he lived almost four years without a return of the symptoms.

Nov. 11, 1905, a suprapubic prostatectomy was made. A large median and both lateral lobes were enucleated. Urine began to pass per urethram on the 9th day. He was up and about every day after the operation. Urine passed per urethram and without pain, and the suprapubic wound closed on the 17th day.

It has been our practice to have these patients sit up and walk about their room as early as the 3d or 4th day, at least; they seem for some reason to do better than if kept confined to bed.

We learn from the proceedings of the French Urologic Association, Escat presented the reports of 410 cases of perineal prostatectomy; with 11.3 per cent mortality; 8 per cent urethroperineal or rectal fistula; and 3 per cent permanent incontinence.

Escat favors perineal to suprapubic prostatectomy because the mortality of the latter is greater (10 to 15 per cent).

Proust collected 813 cases of perineal prostatectomy, with a mortality of 7.3 per cent. He frankly

admits that the suprapubic gives better results than the perineal operation.

Albarran found in 39 perineal operations that the removal of the prostate was easy in 29, difficult in 7, and impossible in 3. He thinks the advantage of perineal over the suprapubic operation is the lower mortality. He is further inclined, however, to believe that improvement in the technic of the transvesical operation will reduce the mortality, and become the future operation of choice; for, he says, the therapeutic results of the transvesical operation are remarkable. Furthermore, there are no permanent fistulæ, no cicatrical contraction of the neck of the bladder, no injury to the rectum, and no loss of sexual power following the operation. The barrier to be considered is, solely the greater mortality.

In England the transvesical enucleation of the prostate holds first place, and the results obtained by Freyer in his 206 cases operated upon are not to be equaled by any other operator known in literature. His first report was of 110 cases operated upon with a 10 per cent mortality; his second report was of 60 cases with an 8.3 per cent; while his last report was of 36 cases with one death, or 2.7 per cent mortality.

In America, Deaver, Fuller, Lilienthal, Bellfield, and Halstead are about the only well known surgeons that have declared themselves in favor of the transvesical operation.

It is now conceded by the ablest advocates of the perineal operation that the results are far from being equal to that obtained by the transvesical, and, were it not for the greater mortality in the latter, this would be the operation of choice. The increased mortality is attributed to the result of infection in the prevesical space. It would be temeritous on our part to maintain that this is erroneous; however, in 23 suprapubic vesical sections, in our experience, infection in this territory never took place.

DEFINITE REASONS FOR THE TRANSVESICAL OPERATION

1. Prostatism, in our experience, was due to other causes than hypertrophy of the prostate in 40 per cent of cases, and frequently an exact diagnosis cannot be arrived at until after a suprapubic exposure of the vesical neck.

2. Severing the constricting fibrous bands at the neck of the bladder or dividing the hyperplastic tissue in the posterior commissure (so-called prostatic bar), digital divulsion of the prostatic urethra (thus the vesical outlet is established at the apex of the bas-fond), and establishing efficient drainage and post-operative vesical lavage, are the only essential requirements in a large per cent of cases.

3. The indiscriminate enucleation of the prostate in all cases of prostatism is unnecessary. It adds trauma, and, if perineal, disturbs the nerve and vascular supplies, produces hemorrhage, increases shock, prolongs the operative time, and may be responsible for increased mortality.

4. The transvesical approach to the obstructing elements at the vesical outlet (which are practically intravesical) is anatomically indicated, and is the simpıer procedure. The trauma produced is in less complex tissue structures; and is not followed by the sequelæ incident to the perineal operation,—incontinence, impotence, urinary fistula, etc., owing to the fact that we can survey every step in the operation by optic, instead of relying on tactile, vision; in other words, we are operating in the light instead of in the dark, and thus injury to the true sphincter of the bladder and rectum can be avoided.

In a contribution to the Kansas Medical Society, in May last, I raised the following points: Necessity of an exact diagnosis, and the necessity of establishing the vesical outlet at the apex of the bas-fond. I also contested the wisdom of the total enucleation of the prostate in all cases of prostatism.

SUMMARY

1. More conservative and rational operations will yield better results, and lower the mortality-rate.

2. An exact diagnosis in many cases can only be made upon suprapubic exposure of the vesical outlet.

3. The suprapubic operation can be done with greater definition, and will yield better results than the infrapubic in morbid conditions in the male, as has been the case in the female, pelvis.

4. The suprapubic route is as rationally indicated for the relief of the above-named obstructive conditions at the urinary outlet, as it is in vesical calculus.

5. The perineal operation offers only 30 per cent of cures, with a 7 per cent mortality and a 50 per cent chance of having exchanged one urinary difficulty for another, and not infrequently a lesser for a greater one; while the transvesical operation entirely relieves all who survive it of their urinary troubles, if they are due to obstruction in and about the vesical outlet, except when they are carcinomatous in character, and it does so without sequelæ and, with the improved operative technic of to-day, with no greater mortality.

CONCLUSION

1. The controversy that is now going on relative to perineal and suprapubic prostatectomy, is only a repetition of the one waged when lithotomy was undergoing its evolution. Who to-day cuts for stone in the male bladder per perineum?

2. The most essential thing to-day is to bring home the facts to the profession in general: First, that prostatism is due to other causes than hypertrophy of the prostate gland; secondly, that the transvesical operation for prostatism has attained a sufficient degree of perfection to be recommended to this class of pitiable sufferers, with the assurance of a cure if availed of before the inflammatory process has reached the kidney and arrested its functional activity; thirdly,

that they should not be submitted to catheterism in the future as they have in the past until it is hopeless to interfere surgically.

DISCUSSION

Dr. Henry T. Byford, of Chicago.—I rise to say a word or two, first, because I am a gynecologist and have never operated on a case such as the essayist has described; second, because I would like to say something about a condition in the female which simulates prostatism in the male. I have had many cases in females in which all of the symptoms described were present except those of obstruction or retention. In examining the female bladder with a cystoscope it is common to find congestion or inflammation in the region where the prostate would be if the sufferer could have chosen her sex.

I was interested in the cases in which the author reported the condition of the urine. In some of them, I understand, there was kidney irritation, and in others abnormal conditions of the urine, such as irritate the mucous membrane. And I think enlarged prostate must often be due to the same kind of irritation that affects the trigonum in women. This irritation cannot be entirely due to age or to the sclerotic changes which occur as the result of age. Prostatism does not come from sexual irritation, because we find it occurs in men who have never indulged in sexual excesses nor had blenorrhagic diseases. When I compare prostatism in the male with hyperemia and inflammation of the trigonum in women, which are conditions caused by the prolonged irritation of abnormal urine, and which have often lasted for many years, I am inclined to think that if such women had prostates the latter would become enlarged from the irritation of the mucous membrane, and would become a temptation to the surgeon.

Inasmuch as the symptoms are connected with enlarged prostate in only 15 per cent of the cases, it is possible that there is a gouty diathesis behind them, and that the early employment of the dietetic treatment recommended by Chittenden, Fletcher, and others of reducing the calories from three thousand to fifteen hundred—would prove beneficial. The reduction of the starch and sugar, which constitute the bulky excess of modern table diet, and which distend the stomach, ferment in the intestine, and load up and contaminate the urine, is more often necessary than a general reduction of the diet. It would seem to me that such cases should, as a rule, be operated upon from above, as one could thus explore the

bladder more satisfactorily and judge of the indications for treatment. With a better understanding of the cause, and with proper treatment at the beginning of the symptoms, prostatectomy may, like oöphorectomy, come to occupy a larger place in history than in surgery.

Dr. James E. Moore, of Minneapolis, Minn.—Twenty years ago or more I did my first prostatectomy. I did it suprapubically, and as it was done at that time it was a blind, bloody, fatal, and unsatisfactory operation. A few years ago, when perineal prostatectomy was suggested and practiced so successfully, I took that up, and have been advocating it ever since, always maintaining that there were certain cases that might be better operated upon by the suprapubic route, as it is done at the present time, not as it was done formerly. To-day, I believe, we may theorize as much as we please as to why we should do the upper or lower operation, yet every practical surgeon will realize that there are some cases which should be operated upon suprapubically, and others that should be operated upon through the perineum. In my judgment, a man is not broad-gauged and does not do his best work until he does both operations. I believe that because it has been a process of evolution with me. I have see-sawed back and forth, and that is where I stand to-day. I have said enough and published enough about the perineal route; and, as many of you are familiar with what I have written and said about it, it is not necessary to consume time now in going over it. It is the operation of choice. I believe it is the operation of choice to-day by the vast majority of surgeons; but since the technic of the suprapubic operation has been much improved, it is often a satisfactory operation, although not always, as the essayist would lead us to believe. All patients operated upon by this method will not recover. While the essayist has been very successful in operating on this series of cases, the next six patients upon whom he operates by this method may die. He may get them all in a bunch, as sometimes happens. When I was doing the suprapubic operation I thought I was doing fine until I had some fatalities, which led me to change routes. In a paper which I presented at the Denver meeting I reported some deaths. I heard Dr. Ferguson report twelve cases with no mortality from the operation; but the next three or four patients operated upon died, and from that time on he has had a death now and then, and, of course, Dr. Ferguson is a man who has done a large number of these operations.

The mortality-rate is only a comparative affair, and, unfor-

tunately, no one thinks so much about mortality-rate as the man who has had trouble. When a man is very successful by adopting a particular method he will report his cases; but if his patients should all die he will keep quiet. Here are grave pathological conditions we have to contend with, and we must have some mortality.

The essayist spoke of stricture as one of the serious objections to the lower operation. I have never seen a stricture after perineal prostatectomy. They do occur, no doubt, but I have not seen one. The patient the doctor reported as having operated upon last February, if he lives long enough, will come back for another operation.

When we began to do operations upon the pyloric orifice of the stomach, we dilated it, and the patients returned at the end of six months or so for another operation. In the prostate we have similar conditions to contend with. Moullin has said that many times he has seen little separate fibroid tumors quite within the urethra, which cause obstruction and which could not be affected by dilation. Dr. Bowers in five years from now will give us his views materially modified.

In the last six months I have re-operated upon two cases which I reported as successful perineal operations some five years ago. I thought what I did at that time was sufficient. One man was forty-nine years of age. He had decided prostatic symptoms. The lateral lobes were enlarged. I removed these lobes, and at that time there was no evidence of a third lobe. Now, he comes back with a third lobe, so that it may be if we do a suprapubic operation, doing a complete job, our patients will not have recurrences.

Dr. W. W. Grant, of Denver, Colorado.—There are one or two points I would like to allude to. There is no more unfortunate condition that that of catheter life, and when it comes to that some form of operation is demanded, sooner or later. The individual case should determine the choice of route. I have for years maintained that for the average case the perineal is the much more desirable.

In reference to the first case reported by the essayist in which he had a depressed bas fond, pus, granular and hyaline casts—if there is any case that requires the perineal route, it is such a case as that. The dirty cases are better and more safely operated upon through the perineum because it is more perfect, the clean cases equally by modern suprapubic cystotomy, particularly in cases of very large prostate. In some of these cases where the prostate is only moderately enlarged

the Bottini is a good operation, but we should never use that in the dirty cases.

In the cases reported by the author of the paper, it would be interesting to know what anesthetic he used, where there was manifest evidence of kidney disease, and if he did not assume great risk in operating upon such cases with manifest disease of the kidney unless operation was imperatively demanded.

I think the views entertained by the profession to-day, as has been demonstrated by Young of Baltimore, and others, are, where drainage is considered important, in favor of the perineal route.

Dr. J. W. Andrews, of Mankato, Minn.—To one who does not operate very often, a discussion of this kind is of great interest. I have heard this subject all thrashed over years ago in favor of the perineal route. I have yet failed to see why the perineal route is not a better mode of operation in the majority of cases. I believe, as suggested by Dr. Grant and Dr. Moore, that there are selected cases which should be operated upon by the transvesical route, but in the majority of cases the perineal route seems to me to be the better one. I have operated eleven times, with one death. One of my operations was done suprapubically. I found it a difficult and a very unclean operation, and it was also very difficult to get good drainage; but possibly that was due to my lack of experience. I think lack of drainage is one objection to the suprapubic route. The drainage is not, and cannot be, as good by that route as it is through the perineum.

As to the sphincter of the bladder; I cannot see where any great harm will result from dividing the sphincter, for it is only divided and not destroyed. How surprised we are sometimes when we do an awkward operation and take away nearly all the prostatic urethra to find our patients make a good recovery. It is wonderful how fully they recover after some of these operations. Of the ten cases in which I have been successful, I could not ask for a nicer, cleaner, better convalescence. That is an evidence that drainage was good, and I have been agreeably disappointed to find how nicely the patients would void urine, and how well they would retain it a few weeks after the operation.

There is one thing I have noticed. More than one-half of my patients have annoyed me very much after they got up, and after the wound had healed, by saying that they were no better, that they could not retain their urine, and that they would soil their clothes, yet after two or three weeks, all those symptoms would pass away.

Dr. M. L. Harris, of Chicago.—We have found in surgery that when a man attempts to generalize from a few cases his generalizations are always wrong. The essayist generalizes from twelve cases that the suprapubic route is the only one to be done, consequently he is wrong. We know there are many cases in which a good and thorough operation cannot be done by the suprapubic route. There are also many cases in which the best operation can be done only by the suprapubic route; consequently we must select the best operation for the particular case. How can we do that? By abandoning all our methods of accurate diagnosis, as recommended by the doctor? He says he has given up the intravesical or urethral means of diagnosis. We can never determine what is the matter with the bladder when we abandon methods of diagnosis. We must employ them, and since we have employed them more universally and with greater skill we have been able to select the proper operation to suit the particular case. We might as well give up the cystoscope in diagnosis in bladder cases in determining what to do as to give it up in operating on the prostate.

The one point I wish to make and lay stress upon is, that every case of prostatism should be accurately diagnosed before we attempt to select the method of operation, and we can diagnose it only when we employ all the means at our command, and one of these means is a thorough cystoscopic examination. In this way the doctor will meet the fewer surprises. He said that when he opened the bladder he was surprised at the conditions found. Many men have been surprised at the conditions found when they did not look into the bladder to see what the trouble was before they operated.

I attended a clinic, given recently, in which there was bulletined an operation of suprapubic prostatectomy. The operation was done, but after a little embarrassment on the part of the surgeon he pulled out four or five big stones, and there was no enlargement apparently of the prostate. Here was a suprapubic prostatectomy done for the removal of vesical calculi. Had this surgeon used the cystoscope before operation he would have been saved the embarrassment of unknowingly operating in the presence of vesical stones.

Dr. Bowers (closing the discussion).—I was very glad to hear the remarks of Dr. Byford because he brought up a question that the foremost operators are contending for, and which I have contended for at a meeting, held last year, of the Kan-

sas State Medical Association, that prostatism may be due to something else than hypertrophied prostate.

As to the remarks made by Dr. Moore regarding the perineal route being the better, I will say that they were along the same lines as those made by Dr. John B. Deaver in which he reasoned that in some cases where the gland developed in a downward and outward direction it was the operation of choice, but it is begging the question when a man says to an audience to-day, in the light of our present knowledge and the literature of the subject, that one route is better than another without giving more definite reasons. If there are two railroads running from here to Chicago, and both of them have the same equipment, and leave here and reach there at the same time, we can say they are equally good. But there is a difference; the suprapubic operation has not the distressing sequelæ that are incident to the perineal. To say that either route has a preference in individual cases, and not give the reasons why or not classify the cases, is begging the question.

Dr. Deaver has said that some of the glands develop in a downward and outward direction, and not into the bladder. In his recent works he reckons that any enlargement of the prostate will move in the direction of least resistance. Study your anatomy in regard to the suspensory ligaments or in regard to the fibrous capsule, and you will see it cannot go any place else than into the bladder.

Dr. Moore has said that I will have deaths if I continue to operate by the transvesical method. I expect to have some mortality attending this operation, and when you read my paper, gentlemen, you will find that we explain why you get deaths. You do not get a mortality because of the suprapubic operation *per se*. If you will read the proceedings of the American Urological Association, published in the American Urological Journal in July and August last, you will find the statement is made that the suprapubic route would be the route *per se,* were it not for its mortality, and that mortality comes from infection in the prevesical space. Our experience in 23 suprapubic cystotomies without an infection would not corroborate this statement.

Dr. Moore says that he has never seen a stricture following perineal operations. There has been stricture in 17 per cent of the cases so operated upon after three years, as reported in the proceeedings of the American Urological Society. We have operated on one such case ourselves. We could not get into the bladder through the urethra,—and we could not introduce a filiform bougie. The patient had been operated upon

by one ex-president of the American Urological Society eighteen months before. He now had a stricture. We operated on him in April last. He has no stricture to-day, and can pass his urine without the use of a catheter.

Again, the proceedings of the different national urological societies show about the same results, namely, that three per cent of the patients operated upon per perineum have permanent incontinence of urine. I refer the gentlemen for information to the last issue of Progressive Medicine.

SOME OBSERVATIONS ON RENAL SURGERY

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Notwithstanding the marvelous development of renal surgery since the first nephropexy, by Hahn, in April, 1881, there still remain many things to be improved upon.

The aim of operative intervention should be the eradication of pathologic conditions and the complete restoration of function where feasible. The post-operative history of patients subjected to surgical intervention for the correction of movable kidney will convince the most sanguine that many of these operations fall far short of the ideal result. The principal reasons for this are explainable on the grounds that certain co-existing pathologic conditions of the kidney, besides its preternatural mobility, but thereupon dependent, are overlooked at the time of operation, and, again, that operative procedure is not sufficiently based upon anatomic principles.

In all the organopexies the technic should be founded upon the strictest anatomic facts. In the operation of nephropexy the surgeon should have in mind a picture of the kidney occupying a natural position in the body, as well as of the structures which must be disturbed in order to render the organ accessible for operation. Any one who has ever undertaken to approach a kidney in the normal position through the incision habitually employed for nephropexy, cannot fail to remember how it was necessary to reach upward, backward, and inward, in order to seize the

organ. It is an easy matter, then, to see that in nearly all nephropexies that the organ is fixed too low in the loin and too near the anterior wall of the abdomen and generally too far from the center of the vertebral column. The effect of this, in many cases, is to put the renal pedicle on the stretch and sometimes to create a vicious angle between the ureter and the inferior pole of the kidney, offering an impediment to the passage of the urine along the ureter.

As often performed, the kidney is brought up from an unnatural position in the abdomen, and suspended by its convex border in an almost equally unnatural position from the side. When the vessels and nerves of the renal pedicle are not placed upon the stretch, and a bad angle is not formed between the lower pole of the kidney and the ureter, and there is no pathological condition of the kidney, no great harm ensues, and the result seems good.

The conditions most likely to obviate the success of the operation are pyelitis, with or without sacculation of the pelvis, a small stone, or a valvular condition of the infundibular portion of the ureter. This last condition was first pointed out by the lamented Fenger. His investigations were so complete on this subject that one cannot do better than to study his writings. Kuster has also contributed much valuable information on the subject of malformations in the pelvis of the kidney and upper part of the ureter.

There are certain cases where the kidney is hyperemic to such an extent that it is subjected to pressure by its capsule, and the organ, therefore, requires decapsulation as a preliminary step to fixation. A kidney that is large or lobulated should always be decapsulated before fixation. In many cases the tunica propria will be found strongly attached in spots an inch or more apart. This seems to be but an increase in the density of the normal attachments between the tunica fibrosa and the renal substance. The more

difficult it is to detach the capsule from the kidney the more reason there is for doing so. It may be justly set down as a rule that nephropexy should never be performed without at the same time doing everything possible to find out whether or not the organ is diseased. The urine should be studied thoroughly in all cases where fixation is contemplated. Blood in the urine may indicate a stone in the kidney, a malignant growth, or neuralgia, according to Kiliani. Neuralgia of the kidney no doubt is a veritable entity, but it is difficult to comprehend the reason why it should be accompanied by renal hemorrhage. According to Kiliani, pyuria unaccompanied by perturbation of the urinary function without cylindrical casts and with but little albumin, signifies the existence of pyelonephritis.

Hematopyuria ought to cause one to suspect a stone with infection. The presence of the bile derivatives in the urine signifies that the kidney is pressing upon the bile-ducts or that we are dealing with an affection of the liver or gall-bladder instead of a floating kidney.

A very important hindrance to success in the surgery of movable kidney rests in the fact that Glenard's disease exists so frequently as a complication. In the presence of this condition it would be but little use to perform nephropexy, and leave the enteroptosis to nature.

In devising the operation for movable kidney there are certain anatomical facts which must be respected. The average measurements of the kidney are four inches long by two and a half inches broad, and one and a quarter to one and a half inches in thickness. It weighs about six ounces. As the kidney lies in the body it is flattened anteroposteriorly. The anterior surface is directed forward and slightly outward. The posterior surface looks backward and somewhat inward toward the transverse processes of the vertebral column. The kidney is concavoconvex from side to

side. The convex border is directed outward, upward, and backward. The concave border looks inward, downward, and forward. The outer border at the upper part is about three and a quarter inches from the center of the spinal column. The outer border at the lower part is three and three-quarter inches from the center of the body. The hilum renalis sinister is two inches from the aorta, and that of the right one and three-fourths inches from the vena cava. The upper two-thirds is covered by the eleventh and twelfth ribs. According to Morris the kidney lies about equally upon the diaphragm and the anterior layer of the posterior aponeurosis of the transversalis muscle. The upper edge corresponds to the space between the last two ribs. The kidney rests upon the ligamentum costovertebralis, described by Henle as originating from the transverse processes of the first and second lumbar vertebræ, and passing upward and outward to be attached to the twelfth rib.

The tunica adiposa, which has much to do with maintaining the kidney in a fixed position, is especially abundant about the inferior pole of the kidney. The kidney within its tunica propria and surrounded by the tunica adiposa, has still another envelop, the perinephric fascia. This last is wanting at the inferior and inner parts of the organ, or, more corectly speaking, its component laminæ do not coalesce at these points, where the perinephric fascia is said to be wanting. This explains why the movable kidney always escapes downward and inward. The tunica fibrosa and the tunica adiposa are bound together by many fine filaments of fibrous structure, which pass from one to the other.

The renal fossa is wider and shallower in the female than in the male. The pedicle of the kidney is composed of the renal artery and vein, and numerous lymphatics and nerves held together by a very considerable amount of connective tissue.

This is sufficient of the topographical anatomy of the kidney to elucidate the principles concerned in nephropexy. There is something to be said in regard to what constitutes a movable kidney. So far as the practice of surgery is concerned any kidney that is mobile beyond the natural range of mobility, may be designated a movable kidney. This is not saying that every movable kidney must be operated upon.

The natural movement is said to occur within the tunica adiposa. All kidneys having a mesonephron are movable and are, of course, congenital. The range of mobility is extremely variable, and is limited by the bounds, in extreme cases, of the lower quadrant of the abdomen on the affected side.

Glenard is the author of the statement that enteroptosis may exist without nephroptosis, but that nephroptosis is never found without enteroptosis. Morris qualifies this statement by insisting that the mesonephron must be present in order for the rule to hold good.

The bile-ducts may be pressed upon sufficiently to induce the appearance of the bile derivatives in the urine. The most frequent complications are restricted to the urinary system.

As before stated, Kuster and Fenger studied profoundly the pathologic conditions of the upper portion of the ureter and the renal pelvis. While these conditions are not necessarily always found complicating the movable kidney, yet they are present often enough to be taken into serious account. A valvular obstruction in the upper part of the ureter may produce a painful dilation of the renal pelvis or of the calyces. A partial hydronephrosis may be brought about by the twisting of the ureter or by the formation of an acute angle by the shifting position of the kidney.

Non-suppurative pyelitis would be extremely difficult of detection. Such a complication might seriously

interfere with the success of nephropexy if undiscovered, and untreated by transrenal drainage. A small stone may be overlooked even with the kidney between the fingers. Valvular impediments in the infundibular portion of the ureter should be treated by a plastic operation or by excision. If the ureter is large and sacculated a portion should be cut away, and the patulousness of the lumen insured by stitching, as we do in intestinal work. It ought to be the rule never to perform nephropexy without delivering the kidney upon the back so that thorough exploration may be facilitated and the necessary procedures carried out. Neglect to do this is responsible for no small proportion of the failures encountered.

In general, the diagnosis of movable kidney is not difficult. There are some cases, however, where absolute certainty cannot be arrived at without exploration. In the obese the diagnosis is always attended with difficulty, but, fortunately for the diagnostician, the subjects of movable kidney are generally spare.

The conditions most often mistaken for floating kidney are the distended gall-bladder, tumors of the colon, and parovarian cyst with a long pedicle. In the differentiation of loose kidney from a distended gall-bladder it is to be remembered that in case of the kidney the range of mobility is directed downward, and that the tumor can almost always be caused to disappear upward and backward under the ribs. In case of cyst of the parovarium with long pedicle the tumor may sometimes be pushed up under the ribs, but there is always a certain amount of difficulty, which increases as the tumor is carried upward.

Any tumor of the colon that would be likely to simulate a loose kidney would be more or less fixed and not so movable as the kidney. A tumor of the kidney and a tumor of the colon might be mistaken, one for the other, but a growth of the bowel ought not to be confounded with a floating kidney.

The methods employed for fixation of the kidney are almost as numerous as the remedies for bronchitis enumerated in the older dispensatories. However numerous, they may be reduced to two classes: those where the fibrous capsule is split and utilized for fixation, and those where decapsulation is not practiced. Two subdivisions may be recognized: the one where the capsule, though not detached, is relied upon for suturing, and the other where the capsule is split and detached, but the parenchyma of the kidney is penetrated by the sutures. It is immaterial as to whether the kidney is decorticated or not. The important point is that the kidney is generally fixed in a bad position and that we are recreant in that we do not pay sufficient attention to the pathological conditions in the pelvis of the kidney and upper part of the ureter that often complicate the situation. When the kidney is fixed in the operative wound, whether decortication is practiced or not, it is evidently fixed too low in the loin and too far external to the center of the spinal column. It is not uncommon that a kidney thus fixed may be palpated after recovery. If we hope to derive the full measure of success from nephropexy we must fix the organ as near where nature placed it as possible. It should be placed up under the ribs and at the proper distance from the vertebral column, except where it is necessary to drain the pelvis or to do some plastic work on the ureter. In all cases where the organ is incised on account of stone or for the purpose of drainage, it will be safer to fix the kidney by the margins of the detached tunica propria to the margins of the operative wound. The only excuse for fixing a kidney to the margin of the wound is where drainage is necessary or where, on account of some pathologic difficulty in the ureter, it becomes advisable to perform nephrotresis. The correct method is the one that fixes the kidney in its natural position. It follows then that the kidney should be anchored

to the twelfth rib or to its periosteum and to the fascia over the quadratus lumborum. For my own part, I prefer to expose the kidney through an oblique incision parallel with, and three-quarters of an inch below, the twelfth rib, cut away the tunica adiposa overlying the convex border, push it away from the posterior surface of the organ, and then divide the fibrous capsule along the convex border and detach for half an inch; then with No. 1, twenty-day chromicised catgut stitch the posterior flap of the fibrous capsule to the periosteum of the twelfth rib and to the fascia over the quadratus lumborum. The anterior layer may be stitched in the same way half an inch from the posterior stitches. This allows the decorticated convex border to rest directly against the fascia. An idea of the distance at which the kidney is anchored from the vertebral column may be gained by passing the finger in against the vertebræ. The inferior pole of the kidney should be anchored half an inch external to the upper pole.

A broad retractor in the upper angle of the wound facilitates the placing of the sutures. Having fixed the fibrous tunic the adiposa is gathered in about the lower end of the kidney, and fastened there by suturing. The perinephric fascia, where it is possible to demonstrate it, should be stitched down over the adipose tunic so as to narrow the outlet at the inferior portion of the renal fossa. A very advantageous stitch may often be placed at the lower angle of the wound. To lessen the force of the respiratory movements that side of the thorax on which the operation has been done should be fixed by strapping with adhesive plaster.

Both Albaran and Jonesco have advised operations with the idea of fixing the kidney in the natural position. The method of Albaran has the disadvantage of the circumcostal and parenchymatous stitches, but the kidney is fixed in a natural position.

Jonesco's method fixes the kidney in a normal position, but is open to the objection of parenchymatous suturing.

Vulliet's method is a good one, and fixes the kidney in a normal position, but there are some difficulties attending the operation.

Tuffier's plan is good so far as the fixation is concerned, but is open to the objection that may be made to nearly all methods, the kidney is left in an abnormal position.

The methods of Jacobsen and Edebohls give permanent results so far as anchoring is concerned, but the kidney is fixed too low in the loin, too far from the center of the vertebral column, and too near the anterior wall of the abdomen. There are many operations which anchor the kidney permanently, but which are open to objection from the standpoint that the organ is not held in a natural position.

Lastly, it may be urged that we do too many nephropexies without making a thorough and painstaking effort to ascertain the condition of the kidney, its pelvis, and the upper part of the ureter.

DISCUSSION

Dr. A. W. Abbott, of Minneapolis, Minn.—If the anatomical relations stated by the essayist are correct, then all women have movable kidney with the exception of one per cent. In a series of over 2,000 examinations there have been but a very small number of kidneys which could not be felt beyond the limit described by the essayist. The limits are correct according to text-books, but they are not correct according to clinical and post-mortem experience. And the same results we get by reference to symptoms. There are very few of these patients who present any symptoms whatever referable to the position of the kidney, which is largely due to the fact that the upper part of the ureter falls with the falling of the kidney.

Dr. William Jepson, of Sioux City, Iowa.—This is a subject whose interest has not been entirely exhausted, and regarding which, with our present knowledge, there exist just grounds for difference of opinion. This is well shown by the

fact that Dr. Abbott has called our attention to the point that the position of the kidney, as determined by post-mortem examinations, is not a criterion of what the position of the kidney is in the living subject. There exists, no doubt, a range of mobility of nearly an inch in every normal kidney, or, rather, a kidney normally placed.

In considering the question of whether we shall or shall not fix any given case of movable kidney that presents itself to us for treatment, there are many problems to be considered. The first of which is, What were the factors which led to the kidney being loosened from its normal moorings, and would they tend to loosen the kidney after nephropexy? If so, fixation would be, in all probability, worse than useless. Take, for example, the cases as observed among the tall, slender girls or women where the waist is contracted, not only normally, but by the tight garments employed to make the figure conform to the dictates of fashion. Can we hope in such cases to benefit our patient very much through renal fixation unless we are first able to remove the causes which primarily gave rise to this condition? I believe not. If we cannot correct the mode of dress, and promote development of the lower part of the thoracic cavity or upper part of the abdomen, that there may be room for the liver and kidney in the region, what is the use of operating?

Again, in many other cases, there exist conditions which pertain to the abdominal wall, such as diastasis of the recti muscles, of general flaccidity of the abdominal muscles prevent ing their giving adequate support to the contained viscera, resulting in a general splanchnoptosis of which the normal kidney is only an incident. Here, again, we have many problems to consider that do not refer alone to the kidney. I believe that each case of movable kidney should be considered in a sense by itself. In a certain number of them fixation will constitute the appropriate and rational treatment, and in certain other cases conditions other than fixation of the kidney must receive attention, otherwise the operation of fixation of the kidney would be useless.

The writer spoke of the importance of decapsulation of the kidney in cases where the kidney is diseased. I do not understand his reason for advocating this except upon the presumption that decortication of the kidney will lead to a diseased kidney ultimately assuming a normal condition, due to the fact that it forms adhesions with the abdominal wall, through which an accessory blood supply is contributed to it, although that is probably erroneous. There are men in this country who

maintain that idea, contending that this is the proper method of treating all forms of nephritis. It has, however, been demonstrated experimentally by many observers in Europe that the decapsulated kidney, in the course of three or four months, will have developed through regeneration a new capsule, and the amount of blood supply the kidney receives from the new source during the time it exists is not sufficient to maintain vitality of more than from one to two millimeters of the kidney structure, as shown by ligation of the arteries or by injection of the two different blood supplies.

Dr. C. W. Oviatt, Oshkosh, Wis.—Occasionally it was necessary to operate in cases of movable kidney. If an operation was undertaken, surgeons should profit by the teaching of Harris, promulgated several years ago, of obliterating the space beneath the kidney rather than trying to suspend the organ alone, either by the fibrous or the fatty capsule. If one simply suspended it, frequently there would be a recurrence of the displacement. The space beneath the organ should be obliterated by the Harris method, making a new pocket of peritoneum, using a purse-string.

Dr. A. E. Benjamin, of Minneapolis, Minn.—I believe this paper includes suppurative processes of the kidney, but very little has been said with regard to nephroptosis. I think in all cases, as Dr. Harris has pointed out, it is very essential that we should make a diagnosis. We should endeavor to demonstrate what is the actual diseased condition of the kidney, and if we expect to cure disease in some of these cases we must have a fixed kidney. In my own work I have laid down three or four rules for fixing a kidney. One is, when it shows evidence of hydronephrosis due to faulty position of the kidney, or to kinking of the ureter, interfering with free drainage. Another is where there is an enlarged kidney, or a congested kidney, with cortical enlargement, and where it is tender. In examining these cases we can elicit pain by palpating the kidney. Another is where the kidney seems to produce obstruction of the alimentary canal, either the colon or duodenum and accessory organs, such as the gall-bladder, common bile-duct, etc. I have been able to demonstrate in these patients obstruction of these organs, especially the colon. Sometimes we find the kidney prolapsed. It becomes adherent down in the pelvis, and these patients are greatly troubled with obstipation. By putting the kidney in position and relieving the adhesions the symptoms disappear to some extent. Dilated conditions of the stomach and a diseased con-

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dition of the gall-bladder, apparently due to loose kidney, are sometimes benefited if the kidney is fixed early.

As to the method of operation, the essayist has gone into it quite thoroughly, and not many of us will disagree with him in his conclusions, but we should emphasize the necessity of filling up the space below the kidney, as that is quite essential. In my own work, in some cases I split the capsule longitudinally, because we can get a better flap, which we can bring up between the fibers of the quadratus lumborum muscle. It makes a firm fixation of the kidney, so that it cannot get out of place afterwards. The position and permanent fixation of the kidney has been demonstrated in a number of cases several years after operation.

DR. BASHAM (closing the discussion).—I will not take up the time of the Association by making any extended remarks, as most of the points that have been raised are well taken. In a large per cent of the cases the principal object is the relief of the pressure on the renal circulation, and this may be accomplished by a simple suspension of the kidney, but decapsulation will bring about a more immediate result, and, as I stated in my paper, the more deficient the kidney, the more reason there is for decortication.

CARCINOMA OF THE DESCENDING COLON

W. W. GRANT, M. D.

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About half of all intestinal cancers occur in the rectum, and next points, in order of frequency, are the sigmoid and descending colon, the cecum and duodenum.

Cancer of the stomach is much more common than of the intestines or any other portion of the alimentary canal. Its progress is more rapid in the stomach. It is much more common in men than in women, and is not common in persons under thirty years of age. In the colon, it is usually primary and circumscribed. Nodules and metastases may produce stenosis, but both are late occurrences.

Chronic indigestion with spells of diarrhea and mucous and bloody discharges are suspicious indications. Distention, with such symptoms, is a late occurrence, and usually indicates constriction. Palpation of the colon will usually reveal a tumor when the abdomen is flat. Ulceration sometimes occurs early, but is not so common as in the rectum. Carcinoma of hepatic or splenic flexure of colon, it is stated, may be easily mistaken for some affection of the corresponding kidney. This is illustrated in the case to be considered. Mikulicz says it may exist several years without producing alarming symptoms or seriously affecting the health. This point the case also confirms. It is less malignant than the same disease of the rectum. It is not very painful until late, when inflammatory adhesions, uually peritoneal, produce acute pain.

Stenosis of the large bowel is not attended with striking or acute symptoms until obstruction is complete. In the small intestine, or in the cecum because of its proximity to the ileum, there are intestinal contraction and violent peristalsis above the constriction. Moderate constriction is not recognized by clinical symptoms. The constriction is due to intrinsic and extrinsic causes. Growths of the intestine and muscular spasms are chief factors in the former, while tumors outside, adhesions, and kink are chief factors without. The duration of carcinoma of the colon, undisturbed by operation, is from two to six years.

Mild malignancy and late metastases being the rule favors radical operation, but the earlier it is performed the greater the prospect of permanent relief.

The following case has some features of interest.

Mrs. J. B. D., aged 44, married, and has three children, the youngest 12. For six years a tumor had been observed located near the anterior iliac crest, which five or six different physicians and surgeons, before she came to Denver, had diagnosed as a wandering kidney. Two years before, in September, 1903, she fell, by tripping, prone on the sidewalk. From that date, she stated, the tumor became more fixed, being before that quite movable. She commenced also to suffer pain in and about it. Finally, in order to improve her general health, she was sent to Colorado last fall, and was placed in charge of Dr. J. N. Vroom. Very early in October, 1904, she commenced to suffer from manifest indications of obstruction. On the evening of Oct. 6th, 1904, I was asked by Dr. Vroom to see the patient with him. Efforts to evacuate the bowels had failed for the past twenty-four hours. She had vomited slightly once or twice in the meantime. The abdomen, though not extremely distended, was sufficient to prevent a satisfactory examination of the growth by palpation, and it was too high to determine anything by rectal or vaginal examination. A

rectal tube was arrested in the upper part of sigmoid, and water injected returned by the tube as fast as introduced. Obstruction was complete and, even if it had not been, colostomy was indicated, and I advised immediate operation. Cases of obstruction of the colon have been reported, by adhesion constriction, from a moving kidney and spleen with long pedicles.

The history in this case indicated long-standing tumor, probably malignant. Awaiting the husband's approval and arrival the operation was unavoidably delayed. The patient grew gradually worse, and Saturday morning, Oct. 8th, she was vomiting fecal matter. The abdomen was enormously distended and her condition extremely grave, yet the patient and her husband both desired the last effort to save or prolong life. She was put on the operating-table as quickly as possible, and with the assistance of Dr. Vroom and the internes at Mercy Hospital, I performed the operation of typhlostomy, believing this preferable to operating at the site of the obstruction. The pressure was so great from distention that it was difficult to keep the omentum out of the field of operation, and the intestinal wall so thin from some cause that gas escaped from an occasional needle puncture in stitching the gut to the abdominal peritoneum, which was done with great care to prevent fecal extravasation. The gut was now incised, and a rubber tube inserted. A great quantity of gas and feces was evacuated, and the intestines were then thoroughly irrigated with normal salt solution. The abdomen collapsed immediately, and the tumor was examined more carefully. It was movable in a limited circle with a fixed point beneath, and was believed to be carcinoma of the descending colon, just above the sigmoid. Vomiting ceased at once, and the patient recovered immediately from the effects of the operation, though in shock for eight hours. She was treated on the operating-table, and after removal, by subdermic normal salt solutions

with adrenalin and strychnine. No peritonitis or temperature followed, and she improved daily until the eighth day, when pain about the tumor from peritoneal adhesions commenced, which required sedatives to allay.

It was my purpose to delay a second operation until the general condition improved sufficiently to give hope of a more satisfactory result, but the increased pain and activity at the site of the tumor showed that nothing was to be gained by delay, and so, at the husband's request and with her distinct approval, though nothing favorable was promised, I operated for the extirpation of the growth, on Oct. 27, three weeks from the date of the colostomy. I made an oblique incision about eight inches long, just above the iliac crest, from the left hypogastrium to the lumbar region. Adhesions were extensive to the abdominal peritoneum, and it was stripped off with the tumor, which was delivered externally. There was an adhesion kink at the upper part from a coil of the colon, which was doubtless instrumental in causing the acute ileus, though the growth had encroached greatly on the lumen of the bowel. Clamps were applied, and the gut severed above and below, and a large Murphy button was inserted. The tumor was examined by a pathologist, Dr. W. C. Mitchell, and pronounced carcinoma.

The patient recovered promptly from the operation, though considerable temperature followed for a few days and then subsided. Pain ceased, no peritonitis followed, and the abdomen remained flat. Rubber drain-tubes were inserted from the lumbar wound. The bowels were easily moved through the artificial anus in the cecum. The abdominal wound healed by primary union throughout its entire extent except at the site of the drainage-tube in the loin. There was a little fecal leakage from the tube, which doubtless came from imperfect union at the mesenteric side of the button, although fortified by a running stitch over

the button. She suffered no more from pain at the site of operation, but in ten days commenced to suffer a great deal from pain at the pit of the stomach, which necessitated morphine. This interfered greatly with nutrition. Whether the pain was due to metastasis I do not know. No tumor could be felt. Emaciation continued and she died, on Dec. 2d, five weeks from the date of the second operation, from general carcinomatosis.

The first operation, though the patient was in extremis, was an absolute and urgent necessity, and the result was exceedingly gratifying. Was the second advisable? Without much thought or consideration this would generally be answered in the negative in view of the advanced malignant character of the disease; yet, probably influenced some by the result of the first, it was desired by the patient and the husband, but without any encouragement from the professional attendants as to a favorable issue. The severe constant pain was completely relieved, and life little, if any, shortened. The slow growth of the disease, the absence of extreme virulence and pain, differing in these respects from the same disease in other localities, and also the late metastasis, demand radical operation for its cure—the earlier the better. The mortality steadily diminishes under thorough extirpation. The radical operation should not be done during an attack of acute obstruction. Colostomy should be done, deferring the radical operation to a later date, when a better condition, local and general, favors a better result.

In an inoperable case the artificial anus is the best for prolonging life. In this case the disease existed, undoubtedly, for six years, as no wandering kidney existed. The fall probably caused localized inflammation, and increased the activity of the growth. I am quite well convinced if the complete operation had been performed two years earlier a favorable result would have ensued. In future I shall not use the but-

ton, which has not proved satisfactory in such cases. I shall use a method which I have employed several times with very satisfactory results in closing an artificial anus of large bowel. First, in end-to-end or lateral anastamosis it is best to unite the mucous membrane separately with chromicised gut, and then the muscular and serous coats, with a supporting serous stitch of catgut, and all with a running stitch. I first used such a stitch in 1892. The advantage of uniting the mucous membrane separately is that it prevents contact of the bowel contents with overlying stitches, giving more time for perfect union, and also minimizing the danger of extravasation. On account of the condition of the intestine in acute obstruction, attempt at union immediately following operation is not now regarded with favor. The mortality is very high when the complete operation is done at once.

There is no uniform procedure, but operation in two stages, sometimes three, is now in general use. Paul's method in obstruction from carcinoma is endorsed by Moynihan in his recent work on abdominal operations. The tumor is delivered without the abdomen, the mesentery and intestine above and below the tumor is stitched to the abdominal peritoneum, the tumor excised, and an artificial anus established in the afferent or proximal end. The abdomen is reopened in two or three weeks, and the anus is closed by end-to-end anastomosis. Mikulicz pursued practically the same method. In the early stage of gradual obstruction, when the patient's condition is not extreme, some deem it wiser to deliver the tumor, and wait twelve to twenty-four hours, before excising, for adhesions to occur. Moynihan pursues this course. Hartman removes the growth at once, and inserts a tube in the afferent end of the intestine for drainage. In two or three weeks he reopens the abdomen, and unites the intestines by lateral anastomosis. Moynihan, end to end. When obstruction is not present the condition of

the intestine above and below the tumor is healthier, and leakage and peritoneal infection are less likely to occur. Under these conditions immediate, complete operation and end-to-end anastomosis should be the method of choice. In extreme conditions of obstruction, typhlostomy or colostomy only should be the primary operation, and preferably not at the site of the tumor.

DISCUSSION

DR. J. W. ANDREWS, of Mankato, Minn.—I would like to ask Dr. Grant if in the case upon which he did a colostomy he found the intestine attenuated, or had it regained its normal condition?

DR. I. B. PERKINS, of Denver, Colorado.—Dr. Grant spoke of suturing the mucous membrane and the other coats separately. It appears to me that this is an unnecessary consumption of time, and that the better method would be to make a purse-string closure of both the large and the small intestine, and then make a lateral anastomosis, very much as one would do a gastro-enterostomy.

I recently—three weeks ago—had a case in which there was a tumor in the region of the cecum, supposed by the attending physician and myself to be an appendiceal abscess. It was very hard. It was in a Swede woman, 62 years of age. She was vomiting fecal matter, and had been for twenty-four hours. A long incision was made in the sheath of the right rectus, and on examination a hard tumor was found, but no pus. The appendix, ileocecal valve, and a portion of the cecum were caught in the mass. I resected a portion of the cecum and about three inches of the ileum, including the ileocecal valve, and closed the end of the colon by the use of the Connell suture, then implanted the ileum into the cecum at the upper portion of the wound. The patient did well except there was a small leakage at the outer and upper portion of the anastomosis and she has a very small fecal fistula, which I think will close soon. I think, however, another time, I would do as I first suggested—close the end of each bowel, and then make a lateral anastomosis.

DR. A. W. ABBOTT, of Minneapolis, Minn.—I desire to call attention to one feature connected with cancer of the colon, namely, intussusception. I have seen two cases in my own practice, and one in the practice of the late Dr. Dunn. I think intussusception occurs in the cancer much oftener in the

large intestine than in the small. I have never seen a case in the small intestine, but I have no doubt it may occur. But the point I wish to make is, that those are the cases in which it is entirely wrong to make an immediate anastomosis. They are the cases in which colostomy should first be made, because the bowel wall about the cancer is always extremely edematous, and on account of swelling the parts will not unite, if you undertake to sew them up. In these cases a preliminary colostomy should be performed.

Dr. J. E. Summers, of Omaha, Neb.—In speaking of the location of carcinoma of the large intestine, I would like to say that I have found it everywhere in the large intestine, that is, in its anatomical divisions, except the hepatic flexure. I have never seen a case of carcinoma in that region. But there is one point to which I desire to draw attention, and that is, in dealing with carcinoma of the transverse colon it is necessary, of course, to manipulate the gastrocolic omentum, and unless this is done with the greatest gentleness, you are apt to have a complication following the operation which may prove serious, I refer to hemorrhage into the stomach. A week ago today I removed the transverse colon for carcinoma, and as a result of my manipulations (the patient, by the way, is doing well) I had for several days a serious hemorrhage from the stomach. My attention was first directed to this complication some years ago following an operation for incarcerated umbilical hernia, where it was necessary to remove considerable portions of the omentum, and the parts had been manipulated in a rather rough way. The operation was attended with no special difficulty, but it was followed in a few hours by profuse hemorrhage from the stomach from which the patient died.

I want to commend Dr. Grant, particularly on one point, that of not trying to do too much at one sitting. Most of the fatalities for carcinoma of the large or the small intestine, or of obstruction of the bowel following operation, I can attribute to having tried to do a complete operation. It is much better to do such an operation as will be of the life-saving kind, and later, if possible, carry out the ideal procedure. There is very little said in text-books about this, but in looking over the literature I find it has been written about by several authorities.

I have seen fatal hemorrhage from the large bowel following vigorous manipulation of its mesentery. This hem-

orrhage is caused by, or is due to, thrombosis in the interior mesenteric vein with extravasation and hemorrhage.

DR. GRANT (closing the discussion).—I have but a word to say. With reference to Dr. Perkins' suggestion as to pouching of the intestine, that is all right. We have two pouched ends, if one chooses to do lateral anastomosis, when the operation is finally complete there is no objection, but after obstruction has taken place it is still appropriate to pouch the lower end of the bowel, although there must be drainage, and the upper end is left patent after 24 hours' time for that purpose. Hartman uses lateral anastomosis, while Moynihan prefers end-to-end anastomosis.

There is one point I wish to urge, and that is that the symptoms are not pronounced at an early period of this disease, and that even with suspicious indications it is very important to use more care in examining these patients than the surgeon is accustomed to use. Under favorable conditions, when the bowels are thoroughly evacuated, we may discover the presence of a small growth in the colon, and this is the time when operation is usually followed by a satisfactory result, and also a period when the complete operation can be done at one sitting.

THE CHOICE OF LIGATURE AND SUTURE MATERIAL IN THE SURGERY OF THE PERITONEUM

H. G. WETHERILL, M. D.

DENVER, COLORADO

During the evolutionary period of abdominal surgery non-absorbable ligature and suture material was used almost exclusively, both inside the peritoneal cavity and for the closure of the abdominal wound; and either twisted or braided silk was most commonly chosen for this purpose.

Those who are familiar with the methods of twenty years ago will recall the stitch abscesses presented by almost every patient and the post-operative pains and distress, as well as the slow convalescence and incomplete recovery or confirmed invalidism which followed. So common were these sequelæ that patients frequently refused operation, saying they had known many others who had been operated upon, and that they were worse after the operation than they were before it; and far too often it became necessary to admit, to ourselves at least, that the objection was a valid one and that the criticism was unfortunately true and well founded.

In the face of all this we were conscious of having removed gross pathologic lesions, and quite unable to understand why complete recovery and good health did not always follow our operations, till at last some fellow pointed out that our mass ligature of silk, of high calibre, though sterile to start with, was often

infected in being handled or placed about foul pedicles, and that it then became a foreign body and an irritant, and not infrequently an infecting focus for the formation of a new abscess. The painfully persistent sinuses might, however, after months or years, yield up the offending rope of silk with its enormous knot, and at last recovery could be expected.

The results of this unhappy experience were shown after a while in the general adoption of either absorbable ligature and suture material, or of very fine silk for intra-abdominal work, and the abandoning of mass ligatures for the better method of ligating individual blood vessels; and, better still, all knots in ligature and suture material were made small and tight, and as few as possible were used. Of late, however, there has been a disposition to forget or to ignore some of the valuable lessons of these experiences.

The recent introduction of linen thread infiltrated with celluloid (Pagenstecher thread or celluloidzwern), now so commonly used in stomach and intestinal surgery, has led some of us into a partial repetition of the errors of the past, and this seems a fitting time and place to consider the value of the Pagenstecher thread, and to discuss its limitations.

It has not the absorbent quality of silk, and this with its smoother surface makes it far more resistant to accidental infection in handling after it has been sterilized, but, best of all, it has not the capillarity of silk, and so does not carry fluids along its tract and spread infection, but it is undoubtedly far more resistent to absorption and disintegration than is silk, and so remains a foreign body and an irritant for a much longer time. It is strong and light, and is easily handled and tied or threaded into the eye of the needle, and knots tied in it have little disposition to slip. Compared with catgut we find each possesses valuable qualities of its own not shared by the other, and we must conclude that each has a field of usefulness of its own. The

absorbable quality of catgut makes it, for certain uses in the peritoneum, the material of choice, and this quality alone compels us to use it notwithstanding its known disadvantages, such as the insecurity of knots carelessly tied, etc. The excellent qualities of these materials are complementary, however, one being strong where the other weak; and the best and most carefully considered surgery of to-day will aim to use each in its field of greatest usefulness, making one supplement the other and fortify its weak spot.

To illustrate: in the operation of gastro-enterostomy or entero-anastomosis by the suture method, the Pagenstecher thread is splendidly adapted to the through-and-through suture of the mucous and serous coats, because it is permanent, without capillarity, and soft and strong and pliable, and when its usefulness is at an end it is cast off into the intestinal canal and eliminated. It has been said that "if silk or linen is used for this suture it may hang *in situ,* suppurating, for months" (Wm. J. Mayo, Annals of Surgery, November, 1905). While in rare instances such a suture might be retained for a long time, its advantages so far cutweigh its disadvantages as to make its use in such a situation desirable. Catgut is so short-lived and uncertain, even when strongly chromicized, when in contact with the intestinal juices, that it cannot be depended upon, and the practice of using catgut for the mucous stitch and linen for the serous one would seem to me to be a reversal of the best method of application of these materials, particularly as the serous stitch of linen becomes a permanent foreign body with all the disadvantages and dangers that this implies.

On the other hand, a fine chromicized strand of catgut of moderate life is preferable for the serous stitch, inasmuch as it insures coaptation of the parts for as long a time as is necessary, after which it is absorbed and cannot become an irritant through its retention as a foreign body, for, of course, the passage

of this second stitch into the intestinal canal must be difficult or quite impossible.

While very fine silk or Pagenstecher thread may be tolerated for serous stitches in the peritoneal cavity, it must be conceded that they carry with them the possibility for harm, and in my opinion such stitches and ligatures would be better if of absorbable material. I once operated upon a lady rather more than a year after an appendectomy had been done for her, and I found encysted at the site of the appendix a purse-string suture of fine silk which showed no signs of absorption nor had it been cast into the bowel. The removal of dead ligatures of silk from the fallopian tubes has been necessary years after they were placed, and as a rule they have been found little changed. It may be said that these dead ligatures do no harm, but that is not a logical or rational conclusion; besides, we know it is not true, for all of us have seen many patients who suffered severely from this cause.

Soon after the introduction of the Pagenstecher thread I began to use it for a purse-string suture about the stump of the appendix in my appendectomies, as did many of my colleagues. I always used the smallest size, and tied a firm, compact knot. After this technic was adopted many of my patients complained of constant pain and tenderness in the appendix region, some of them declaring that they had more pain after the operation than they had ever had before it, a story reminding me of the days of the mass ligature on the stumps of the oviducts. I saw some patients of other surgeons who followed a like technic, with like symptoms, and I concluded that my non-absorbable ligature or suture material was at fault, and I at once adopted another method. It has not been necessary in any of my cases to perform a second operation for the removal of the dead ligature, though the pain has in some instances lasted for more than a year and been very severe.

In the published transactions of the last meeting of this Association appears an allusion to a like experience by Dr. Archibald MacLaren in his paper on appendicitis in women, and I am forced to conclude that his deductions and mine, from the same premises, are correct, and that the linen thread was the cause of the pain. At any rate, it seems to me to be logical, and I shall no longer use non-absorbable ligature or suture material for purely serous surfaces. The absolute sterilization of catgut is no longer difficult, and we now realize that so-called "catgut infections" usually have their origin in a contamination of the gut through handling or in allowing it to come into contact with unclean surfaces or substances in or about the wound. Then, too, the chromicizing process prolongs the life of even the smaller strands to any desired time, providing the mucous surfaces and secretions are not in contact with it. These features make of catgut an ideal suture and ligature material for intraperitoneal use, and all that becomes necessary is the exercise of due care and skill in the selection of the catgut and the application of sutures and ligatures and the making of knots. So far I have had the good fortune never to have had a secondary hemorrhage or other accident from the use of catgut, either in the way of a slipping knot or of too rapid absorption, and I believe this immunity from accident to have been due to the exercise of extreme care in its application.

In this connection allow me to add that for about three years I have had great satisfaction in the use of the Downes' electrothermic cautery clamp in selected cases, thus doing away with all ligature and suture materials on pedicles. For vaginal hysterectomy, particularly in cancer of the uterus, it is ideal, promoting rapidity and safety in the work, and, without doubt, gives much greater security against the danger of recurrence in early cases. There is, furthermore, in my experience and judgment, no doubt that patients oper-

ated upon with the Downes' clamp by either the vaginal or abdominal routes have smoother and more rapid recoveries, and, above all, a very noticeable freedom from the intense pain and backache so common after all pelvic operations when the terminal nerves of this region are left for days or weeks in the bight of a securely tied ligature or closely applied suture. I have had one or two experiences with the Downes' clamp, however, which lead me to believe that there is increased danger from thrombosis and embolism after its use, occasionally occurring several weeks after operation; and until this doubt is settled I shall be most careful in the selection of the cases upon which it is used.

DISCUSSION

DR. WILLARD BARTLETT, of St. Louis, Mo.—If a visitor may be allowed to take exception to one of the statements embodied in Dr. Wetherill's paper, I should like to do so by calling attention to some experimental work which was done a few years ago by Clumpsky in the clinic of Professor Mikulicz at Breslau, which has reference to the length of time that through-and-through gut sutures hold, or to the length of time they were used during which they did no good whatsoever.

Clumpsky sutured the intestines of a large number of dogs, and then exerted hydrostatic pressure on the interior of these intestines at various times after suturing. He found that in end-to-end sutures the sutures were resistant to intra-intestinal pressure for the first forty-eight hours; that is, they would maintain the same intra-intestinal tension without bursting at the suture line for forty-eight hours, the same as would be originally applied. After the first forty-eight hours the establishment of granulation tissue around the sutures rendered the gut somewhat cheesy, that is, rendered it of such consistence that the sutures began to cut, as all sutures do. Some time after their insertion, and from the end of the second day up to the end of the fifth day, there was progressively a lower resistance to the column of water; that is to say, when the suture was first made it held a pressure of ten pounds theoretically, and at the end of twenty-four and forty-eight hours it

held ten pounds At the end of the third day it held eight pounds; at the end of the fourth day it held six pounds, and at the end of the fifth day it held five pounds. It would not have mattered what suture material had been used provided the material had lasted five days. I am of the opinion that catgut can be so treated that it will last five days. From the end of the fifth day there was plastic union; and actually the granulation tissue between the two edges of the coaptated gut was sufficiently changed into connective tissue that in consequence of the same the intra-intestinal tension could be increased without bursting taking place. At the end of the fifth day it was the lowest possible; at the end of the sixth it was a little higher; and at the end of the seventh it was still higher; but it was not until the end of the tenth day that the same intra-intestinal tension could be maintained as high as that applied immediately when the suture was put in. It took two weeks before the gut would hold up as much at the suture line as it would hold before any section and suturing were made.

To recapitulate: If the suture was made certain, ten pounds could be maintained, and this was maintained up to the end of forty-eight hours. The intra-intestinal tension decreased at the end of the fifth day; it was re-established at the end of the tenth day; and at the end of fourteen days it was the same as that of the normal gut. These experiments prove that suture material does as little good as through-and-through suture after five days.

There is one other point I wish to refer to. I think Dr. Wetherill over-estimated the value of the inner row of sutures. Professor Kocher, who has done a large amount of intestinal and stomach work, has recently published 102 resections of the stomach, and he and other surgeons have advanced the idea that the interior row of sutures acts as a hemostatic and as a temporary closure of the field for a few hours or more, or at least until the second row of sutures has been properly placed and until a little fibrin has been deposited over the outside row.

Dr. Arthur E. Hertzler, of Kansas City, Mo.—I did not intend to speak on this subject, but it touches on a question which has interested me for many years. In 1895 I undertook an experimental study of the final fate of silk sutures in the intestines, which were then almost universally used, touching the period of time the silk had gained access to the lumen of the intestine and coming out through

the intestinal canal. I used a through-and-through suture, similar to what is now known as the Connell, to determine the rate of healing of the intestine, going on then with a regular study of the Czerny-Lembert suture. I found that silk in the intestinal wall in the Lembert suture undergoes one of three processes: it may be cast out into the lumen of the intestine, as the text-books at that time stated; it may be encysted and walled in by fibrous tissue within the intestinal wall, and if infection takes place within the grasp of the suture, where there is a walling off of the area of union by adhesions, the suture is thrown off into the localized abscess at that point, and may then be cast off into the lumen of the intestine if the abscess opens into the intestine later on.

In 1895 I operated on forty-four dogs consecutively using a through-and-through suture similar to what is now known as the Connell suture. In four of these I found abscesses outside of the gut. The infection followed along the line of suture, forming an abscess. The cases did not terminate in death of the animal, general infection being prevented by the surrounding adhesions. While I believe in the Connell it is much less certain than the Lembert suture, because of the likelihood of infection to follow along the thread. If it is used as a protection for the Lembert suture, it is much better than the Czerny suture.

As to the length of time it requires the intestine to heal, I have found it to be exceedingly variable. How the experiments in Mikulicz' clinic could have been conducted with such constant results I do not understand, because experimental work in the abdomen, and particularly work of this kind, is followed by very variable results. So difficult is it to get constant results, that I venture to say that either the experiments referred to were not very many, or the technic must have been very exact, much more exact than I have been able to develop, or that there was some failure in the observations.

So far as the nature of the suture material goes, it depends entirely on the one condition as to whether infection can be prevented or not. If infection can be prevented, then plain catgut is sufficient. If infection cannot be prevented, then it depends entirely upon walling off of the intestines by adhesions about them, and no additional safety is added by permanent sutures. The great safeguard in intestinal anastomosis is the protective adhesion about the intestine. If infection does not prevent the formation of

these adhesions, then we are successful in our anastomosis even though local abscess does occur. If, on the other hand, infection prevents adhesions, infection is likely to extend because of the protection afforded by such adhesions being absent.

Dr. Herman E. Pearse, of Kansas City, Mo.—There is very little use of reporting anything regarding the successful use of these threads or suture materials. I would like to report two or three failures which will give us some idea of how we should not trust to sutures too much.

I had a very much regretted death of a little girl of ten in the country, far removed from help, with a perfectly competent nurse with her. In this case there was a circumscribed necrotic abscess surrounding the appendix, which was removed and the cavity thoroughly cleaned out. The opening in the intestine was closed with catgut, and I saw no reason why the patient should not recover. This was the third attempt on my part to close the stump of the appendix with catgut. She had a normal temperature for three days; then a sudden pain, rapid peritonitis, and death.

Post-mortem examination showed complete absorption of a portion of the No. o catgut with which I had ligated the stump of the appendix, and absorption to the point of giving way in the catgut where a purse-string suture had been used. This was pyoktanin catgut. I am satisfied that at some point I perforated the mucous surface of the intestine, and that leaking caused digestion of the catgut and the death of the little patient.

The next was a case in the practice of another surgeon in which the over-and-over suture of the raw edges of the stomach was of catgut, and was so quickly absorbed that secondary hemorrhage of a violent nature took place, weakening my patient to such an extent that we lost her.

These are the only two cases in which I have had trouble with catgut, and I am inclined to think when we make the over-and-over suture, as for enterostomy or any of these anastomotic operations, we should use a fine stitch of catgut that is impregnated with some preservative like formalin.

As to the Pagenstecher thread, I was so unfortunate as to have one come out four or five weeks after a closure for hernia. The next case chanced to be a double hernia (inguinal). I used the usual aseptic technic, employing kangaroo tendon on the right side and Pagenstecher thread on

the left, and the Pagenstecher thread, like the old cat in the story, "came back." Since then I have not used Pagenstecher thread in cases of hernia. It is all right on the peritoneal side of the intestine. I do not like to bury it any place in a case of inguinal hernia.

Dr. John F. Binnie, of Kansas City, Mo.—Choice of sutures must be made with circumspection. For suturing mucous membrane one must use chromicized catgut or something of that nature that will last a long time, and which will resist the digestion that must take place there. The first row of sutures is put through the mucous membrane, and all the coats of the intestine are, of course, as pointed out by Dr. Wetherill, merely protective until the outside row of sutures does its work. But that is not what I wanted to speak about.

I want to draw the attention of the Association to a somewhat new suture material in the line of Pagenstecher. The objection to Pagenstecher suture is that its surface is rough and gritty. If you try to use fairly strong Pagenstecher thread it is difficult to tie a knot. The material does not slip, so that you can tie the knot sufficiently tight. Von Brun has brought out a material which is better than Pagenstecher thread. It is white linen impregnated with celluloidin, which is absolutely smooth. Its surface is as smooth almost as that of silkworm gut. I think it can be improved by putting a little more celluloidin into the thread. If you like, Mr. President, this afternoon I will bring some samples here for inspection. Some of my professional friends have been using this Von Brun celluloidin linen for every purpose in which silk, Pagenstecher thread, or silkworm gut can be used, and it is very convenient stuff.

Dr. J. F. Percy, of Galesburg, Ill.—I have had some experience along the line spoken of a moment ago—of catgut coming out in intestinal work. I had a case which showed evidences of obstruction seven days after doing a simple appendectomy, and on opening the abdomen the next morning I found that the stump of the appendix had blown out. The patient died. I related this experience to Dr. W. J. Mayo, and since that time he has not used catgut in his appendectomies.

My understanding of the Pagenstecher suture is that it is an absorbable one. I removed within a few days No. 3 Pagenstecher linen suture that I had used in the so-called Martin operation or method of doing colostomy, that is, lifting up the mesentery and putting the Pagenstecher

through each side of the wound. In removing the suture five days afterwards half of the diameter had been destroyed. In that region, at least, Pagenstecher suture, I am sure, is an absorbable one. In the intestine it will not absorb so quickly, but I think there can be no question as to its being destroyed.

In the experimental work spoken of by Dr. Bartlett of St. Louis in reference to the time that a suture is of value in the intestine, I think there is another point that has not been brought out, and it is this: It must be true that a large number of intestinal sutures perforate the lumen of the gut. We try to avoid going into the gut, but in our every-day work I am positive that the needle goes into the lumen, and we pull our suture out of the gut through that infeced canal. The explanation of our not having more serious results than we do, as was mentioned in the experimental work cited a moment ago of only four cases of infection out of a total of forty-four, is that immunity is secured through the power of the intestine to bury up the infected suture. We need, therefore, not plain nor even chromicized catgut, because the latter or the chemically prepared catgut is often not well tolerated by the tissues, but a material which never varies when the question of time of absorption is such an important one. The point I want to make is that we need a suture material that will hold the tissues together, even when we do infect them, long enough so that we can get results; and we are not sure we are going to do that when we use catgut.

Dr. F. Gregory Connell, of Salida, Colorado.—As to the relative merits of catgut and Pagenstecker. The former has an advantage in that it is absorbable, and a disadvantage in that it may be absorbed too rapidly. The Pagenstecker thread, on the other hand, is non-absorbable and will always remain in place till the apposed viscera are firmly united.

As to the ultimate fate of the non-absorbable suture. If it does not communicate with the lumen, it usually becomes encysted and remains at or near its original location. But it must be admitted that the majority of gastro-intestinal sutures penetrate into the lumen, and that they subsequently detach themselves, migrate through the wall, into the canal, and pass away. So, in the majority of cases, the final result is the same as that achieved by using absorbable material, with none of its disadvantages or dangers.

If a suture is employed merely to cause seroserous apposition, in which no attempt is made to include the submucosa,

a suture upon which may be placed no dependence for strength, the elimination of non-absorbable material will take place very slowly, if at all, and for sutures of this character, when indicated, catgut would be the more rational material to use.

Dr. Wetherilll (closing the discussion).—I wish to thank the Association for the interest shown in the discussion of my paper, and though we are not all in accord regarding suture and ligature material, and the methods of their application, I have little doubt that each of us secures satisfactory results with the method he prefers and the material of his choice.

CAN THE RESULTS OF CANCER OF THE BREAST BE IMPROVED?

BEVERLY MACMONAGLE, M. D.

Great as have been the advances in treating cancer of the breast in the past four years, there is still room for improvement. X-ray, radium, and serum treatment have been tried and found wanting. The very best results are obtained only by surgical operation. These have been so good that many surgeons feel that they are prevented from attaining a high percentage of cures only by the fact that the cases reach them too late to get the full benefit of surgery. Why do the cases reach us so late?

1. Those who have lumps in their breasts do not understand the risks they are running.

2. They have a dread of surgical operations due to ignorance, or to the knowledge of failures among some of their friends.

3. They do not discriminate between one operated upon early and radically, and one operated upon late and incompletely.

4. They are misled by honest physicians and surgeons who do not insist on making an exact diagnosis of the nature of all lumps in the breast.

The only way to correct the above conditions is for every surgeon to insist on an exact diagnosis in every case of lump in the breast and in the very begin-

ning; not to wait until the classical diagnostic points are present. This can be done only by making an incision, removing the lump, and having a microscopic examination made by a competent microscopist while the patient is still under the anesthetic and everything prepared for a radical operation. The time required for the frozen section is only about 10 to 15 minutes. If there is the slightest doubt, do the radical operation, thereby giving the patient the benefit of the doubt.

Following the above plan, I have had 18 patients in whom the lump was small and, as I thought, benign. There were no symptoms or signs by which I could say the growth was malignant. I explain to the patient its nature, remove the lump, decide by the microscope, and proceed according to the finding, thereby removing doubt as fully as possible. Sixteen of those cases proved malignant, and two benign. The radical operation was done in all 16 cases. All the cases made satisfactory recoveries, and have now no complaints to make in regard to the condition of the hand and arm. The longest time that has elapsed since operation in these 18 cases is five years; the shortest, one year. Of course, this is not sufficient time to say positively that they have been cured. However, the fact that careful microscopic examination was made of the axillary contents and mass, and no malignancy found, except in the particular lump in which it was found at the time of operation, the present health and comfortable condition of the patients are reasonable assurance in regard to the future.

The above exact diagnosis having been made, the most that treatment can yet do has been done.

In doing the operation to remove the tumor for microscopic examination, great care is necessary. The danger of re-inoculation is very great.

In a case in which I considered the tumor in the

breast innocent, I removed the tumor by cutting down to it and carefully dissecting it out, closing the wound, which healed by first intention. Careful microscopic examination showed that I had been in error and that the tumor was malignant. I explained my error to the patient and advised immediate radical operation. This was declined. In three months the patient returned for examination. I found an enlarged and tender gland just at the lower edge of the pectoral muscle. I again urged radical operation. It was again declined. In six weeks the patient returned. The gland was enlarged and still quite tender. I could find no other glands. Operation was accepted this time, and done at once, the dissection being made as carefully as I was capable of. Two glands were found in the axilla in addition to the one found before operation. On examination all these proved to be carcinoma. In about four months from the second operation the patient returned, with the glands in the neck on both sides and those in the mediastinum enlarged and rapidly increasing in size, with difficult respiration and severe pain. Inside of three months the patient died, after great suffering. Here was a case of re-inoculation at the first operation, and rapid advance before the second and radical operation. Therefore, the danger of re-inoculation is very great, and more likely to occur than many are inclined to think.

Since then I have followed the plan of raising the whole breast, covering the muscles, etc., with gauze, and either making the cuts to remove with a cautery knife or cauterizing thoroughly with carbolic acid as soon as the cuts are made. Since following these plans I have not had a case of re-inoculation.

I wish to refer to a patient just operated upon in whom the gland and the skin over it just outside the nipple, as large as half a dollar, and the axillary glands were involved. The patient is 54 years old. She said

she had first noticed the lump when 34 years of age. Two years ago it began slowly to enlarge. Here is a case in which the lump was malignant, remaining stationary for 18 years, or benign, becoming malignant after that time. This goes to prove the danger of allowing such cases to go on until the diagnosis of cancer can be made by the usual examination.

CONCLUSIONS

1. All tumors of the breast are a threat at the well-being of the patient.

2. Positive diagnosis cannot be made in the early stages without microscopic aid.

3. All tumors of the breast should be removed with care to prevent re-inoculation, microscopic diagnosis made, and radical operation proceeded with at once if found malignant. This method gives the best chance of improving the results of surgical treatment of cancer of the breast.

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Since then I have followed the plan of raising the whole breast, covering the muscles, etc., with gauze, and either making the cuts to remove with a cautery knife or cauterizing thoroughly with carbolic acid as soon as the cuts are made. Since following these plans I have not had a case of re-inoculation.

I wish to refer to a patient just operated upon in whom the gland and the skin over it just outside the nipple, as large as half a dollar, and the axillary glands were involved. The patient is 54 years old. She said

she had first noticed the lump when 34 years of age. Two years ago it began slowly to enlarge. Here is a case in which the lump was malignant, remaining stationary for 18 years, or benign, becoming malignant after that time. This goes to prove the danger of allowing such cases to go on until the diagnosis of cancer can be made by the usual examination.

CONCLUSIONS

1. All tumors of the breast are a threat at the well-being of the patient.

2. Positive diagnosis cannot be made in the early stages without microscopic aid.

3. All tumors of the breast should be removed with care to prevent re-inoculation, microscopic diagnosis made, and radical operation proceeded with at once if found malignant. This method gives the best chance of improving the results of surgical treatment of cancer of the breast.

LOOSE BODIES IN THE ELBOW JOINT

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The elbow joint has as bony factors entering into its formation the trochlear surface and the radial head of the humerus, the upper extremity of the ulna with its olecranon and coronoid processes, embracing the greater sigmoid cavity, and the head of the radius. Its ligaments are the anterior and posterior, and the external and internal lateral, and one may also include the orbicular ligament, embracing, as it does, the lesser sigmoid cavity of ulna with which the vertical portion or circumference of the head of the radius articulates, this joint communicating with the elbow joint. The anterior and posterior ligaments form virtually a new capsule, which is thicker and stronger on the sides than in front or behind, in which regions it is comparatively thin and is quite lax, sufficiently so behind to allow of pocketing on each side of the olecranon. It is attached above anteriorly to just above the coronoid fossa and below to the coronoid process and the orbicular ligament. Posteriorly its upper attachment is to the margin of the olecranon fossa, extending to the sides and tip of the olecranon, the lateral fibers extending to the lateral border of the humerus. The internal lateral ligament is attached above to the internal condyle, and extends as two separate bands, one anteriorly to the inner margin of the coronoid process and one posteriorly to the side of the olecranon, where it blends with the capsular ligament. This ligament is strong,

and is one of the chief soft part safeguards of the joint, limiting flexion and extension, giving strength to the joint, and protecting against lateral wrenching. The external lateral ligament is also closely blended with and forms part of the capsule, extending from the external condyle to the orbicular ligament.

The joint articular surface, which occupies but only two-thirds of the distance between the condyles, reaches from almost the outer margin of the external condyle to within nearly an inch of the internal condyle, and slopes downward and internally, the inner extremity of the trochlear surface being nearly one-half inch lower than the outer, the joint between the radius and the humerus being nearly horizontal. Both the joint between the greater sigmoid cavity and the trochlear surface of the humerus and the joint between the head of the radius and the radial head of the humerus, are lined with synovial membrane. Normally, the opposing articular surfaces lie closely in apposition to each other, the trochlear-sigmoid joint helping by its shape to render the articulation a very strong one, well adapted to resist ordinary attempts at separation. The joint is a true hinge joint, so far as motion between the humerus and the ulna and radius combined is concerned, and in addition there is permitted a movement of rotation at the radiohumeral articulation and lesser sigmoid cavity of the ulna. Flexion is permitted to 135°, and is checked, first, by the contact of soft parts and then by the impression of the coronoid process in the coronoid fossa. Extension, permitted to 180°, is checked chiefly by contact of the olecranon and the olecranon fossa.

In pronation and supination the movement takes place between the rim of the head of the radius and the radial depression above the capitellum, pronation being checked by the lateral border of the head of the radius coming against the orbicular ligament, and supination by the oblique ligament and the median

border of the head of the radius coming into contact with the orbicular ligament.

The elbow is exposed to all sorts of violence, direct and indirect, and particularly to strain due to sudden twisting or turning, involving the rotation movements, and to contusion of the articular surfaces from direct violence, not to speak of the fractures of the condyles. In my own experience many sprains of the joint are caused among laborers and others doing heavy work, such as handling and carrying heavy timbers, which often turn in the grasp; also in handling heavy wrenches at work, and, in fact, in all classes of work involving to any great degree rotation at this joint. Injuries by direct blows on any region of the elbow, particularly the lateral and posterior areas, are of common occurrence.

The etiology of loose bodies in the joints is an interesting one, and I wish to acknowledge my indebtedness to various articles on the subject, particularly to the article by Dr. A. E. Halstead, in Vol. 22, 1895, Annals of Surgery, and to Dr. Joseph C. Bloodgood, in the December, 1899, volume of Progressive Medicine. Dr. Halstead states that the first systematic study of floating bodies in joints was made over 250 years ago by Pechlin, a Swedish surgeon, and, following Volkmann, he places loose bodies in two general classes: (1) those that are found in otherwise healthy joints, the disease, if any be present in the joint, being occasioned only by the presence of these bodies; (2) those that are found in diseased joints. He lays down the following conditions as necessary that a loose body may be placed in the first class.

1. There must have been sufficient violence to break off a piece of the articular ends of the bones.

2. There must be a loose body found immediately after the injury.

3. The body must correspond in size and general

contour to the defect found in the bone at the time of operation.

4. Microscopical examination of the body must show it to be made of normal cartilage and bone or of cartilage alone, and unless all or most of these conditions are present, it cannot be assumed that the body was the immediate result of violence. Mention is made of Kragelund's experiment "that in no case could complete separation of a piece of bone or cartilage be produced by violence applied to a dead body; that pieces loosened in this way had to be removed with forceps later in order to entirely free them from these attachments.

The importance of König's osteochondritis dessicans in the relation to the production of loose bodies is dwelt upon, and the statement is made that the cause of the disease is unknown, but that (1) it may follow a traumatism; (2) it may originate spontaneously; (3) it may develop at any period of life; (4) small pieces of the articular ends of bones may be loosened as the result of the disease, causing floating bodies, or the whole articular end of the bone may separate, as occurring sometimes in the hip and shoulder joints.

In but two of the eight cases reported by König could a history of trauma be obtained. The bodies occasioned by this process of osteochondritis dessicans are composed chiefly of cartilage or cartilage and bone, and are usually facetted and smooth, and are often found in the same joint on opposite sides of the body. The knee is most frequently affected. The bodies which originate from the synovial villi are usually multiple and very elastic and composed of hyaline cartilage, and may or may not be impregnated with lime salts. They have no fibrous capsules and no evidence of a pedicle. Dr. Bloodgood's review is also very complete. He states that while authorities are not agreed as to traumatisms being always the cause, Barth and Vollnecht, each in a separate article, present very

convincing evidence that the etiology of the free hard-joint bodies is a pure traumatic separation, and reports that Barth, in a review of the literature, found that Monroe, in 1726, showed that in the majority of cases of loose bodies, free and pedunculated, he was able to demonstrate a corresponding defect in the articular cartilage surface of the joint, and advocated the pure traumatic origin. Barth arranges loose bodies in two classes: (1) the soft bodies, which are due to a degeneration of the synovial membrane or to the precipitates from the synovial fluid, as commonly seen in joint tuberculosis, less commonly in arthitis deformans; (2) the hard cartilaginous, due only to two causes, (a) traumatic separation, and (b) arthritis deformans. Dr. Bloodgood goes on to state, further in his review, that by experiments on animals Barth showed that chips separated from joint surfaces by gouge or chisel always became attached to the capsules, and in the greater number of the cases were absorbed within three months; in the remainder the pieces becoming pedunculated, receiving their blood supply from the capsules, and that such, composed of hyaline cartilage, had always a thin connective-tissue envelope around it, the defect on articular surface of the injured cartilage or bone becoming, as a rule, replaced by new bone or cartilage, and that the surface of separation on the loose piece became in time smoothed over with the layer of cartilage.

While this description applies to the experimental cases, he believes that in man the greater number, if not all, of such bodies, have likewise a nutritive connection with the capsule, but because this is possibly of less duration than in animals the area of bone necrosis is less well repaired by new bone, and there is also always found some calcification, due, he says, to poorer vascular supply through the pedicle, and sections of his specimens always showed on the smooth convex surface the normal hyaline cartilage of the ar-

ticular surface and an envelope of connective tissue, and on the fractured surface an envelope of new embryonic cartilage. If there was any bone area it was always necrosed, and in a few where the pedicle was present infiltration of new bone was demonstrable into the area of necrosis. Calcification was always present in the older and free bodies. There is a history of traumatism in the majority of cases, but because slight trauma is oftentimes sufficient to produce such separation a clear history of traumatism is not always obtainable, the subject forgetting. These studies led him to express the opinion that positively there is no evidence of any disease change, such as the osteochondritis dessicans of König. Barth reported 66 cases in various joints, of which 55 were in the knee joint and 8 in the elbow joint. Vollnecht's cases are 63 in number, and he reported practically the same histological findings of the loose bodies as Barth, and no evidence in the body itself or in a defect on the articular surface of the bone (when he could examine it microscopically) any evidence whatever of König's disease, which, according to Hektoen (Pathology, page 723), is a somewhat illy defined inflammatory condition in which small particles of cartilage from articular surfaces become separated. Warren, in his "Surgical Pathology," states that the cartilaginous tumors to which Virchow gave the name ecchondrosis and which grow directly from cartilage, often become separated when the articular cartilage is the seat of the growth, and become as loose bodies in the joint, stating also that the growth may occur from synovial membrane or periosteum, and may finally become anchored in some part of the capsule. Macdonald, in his "Surgical Diagnosis and Treatment," says that the most common origin of loose bodies is from villous outgrowths of the articular cartilage or the synovial membrane, and that they are called "loose cartilages" from the resemblance of their structure to cartilage, that they are often fibrous and

sometimes bone, and only occur in the larger joints, and that nine out of ten are found in the knee. Blood clots are very rarely a source of origin.

This much for the etiology of loose bodies in healthy joints. It is beyond the province of this paper to enter into the discussion of those diseased conditions of joints, such as tuberculous arthritis with its rice-bodies, the fatty bodies of lipoma arborescens of joints, nor that other diseased state known as arthritis deformans with its tendency to cartilaginous growth and proliferation in synovial fringe and articular cartilage, any further than to mention the almost constant presence of free or pediculated bodies in such states. Stengel states ("Text-Book of Pathology"), that the so-called rice-bodies, fibrous or cartilaginous in structure, are produced from the synovial fringes, and may be free in the joint or attached by the pedicle, and probably in most cases result from injury.

Gwylm G. Davis (Vol. 14, Sajous Annual, 1899) states that the synovial membrane is a prolific source of these loose bodies, the synovial fringe as the result of an injury becoming inflamed, condensed, and finally separated, leaving the detached body floating free in the joint, and that such an origin is shown by the fact that some of these bodies are covered with synovial membrane. Barring the difference in function of the two joints, the symptoms are strikingly similar to those occasioned by loose bodies in the knee joint. While functionally active, there is suddenly a "locking" of the joint, usually in flexion, a sickening pain, and in the majority of cases the patient knows that there is "something" which has caught in the joint. Upon examination of the same, he finds a tender point somewhere on the periphery of the joint, in the three cases here reported, on the posterior aspect, and this tender point overlies the body. In the same article by Dr. Davis, referred to above, the following statements relative to the pain are made: The pain so often asso-

ciated with the presence of these bodies, is largely due to their tearing the capsule in the movements of the joint, and not to their being caught between the bones (Riesenfeld); the pain occurring with foreign bodies in the joints, is regarded as due, not to the pinching of the body between the joint surfaces, but to the stretching of the capsule that takes place when the body lies in certain positions outside the joint surfaces (Larsen).

The elbow is carried in a semiflexed position, and there is inability to fully extend the forearm. This is chiefly due to reflex contraction of the biceps and brachialis anticus muscles, the musculocutaneous nerve supplying both the joint and these muscles. When the body presents itself or the usual "locking" or "catching" of the joint is obtained, the diagnosis is clear, but before such a positive condition occurs, a reasonably certain diagnosis may be made when there are recurring attacks of synovitis without apparent cause, with sometimes considerable and sometimes a moderate effusion in the joint, and a history is obtained of more or less "soreness" in the joint, particularly if the patient gives a clear history of trauma.

Joint changes are very apt to occur, the principal condition being a more or less chronic arthritis with thickening of the synovial membrane and fringes.

CASE I. Matthew W., German, aged 37 years, by occupation a laborer, received an injury to the left elbow, described at the time as a contusion over the internal condyle of the left humerus with a very severe sprain of the left elbow, March 27, 1894.

While on a flat-car unloading rubbish he took hold of a gunny-sack, and in jerking it loose it came out suddenly, and he fell off the car, a distance of some six feet, striking the elbow against a plank laid on the bridge. First seen by me April 24, 1894. There had been considerable swelling of the joint, much

pain, and restriction of all movements at the elbow. There were periods of comparative freedom from pain, but any attempt at motion of the elbow, active or passive, gave rise to considerable pain, and there was to be felt and heard a peculiar soft creaking or grating in all parts of the joint on active or passive motion, more marked when done with resistance on the part of the patient.

The condition was thought to be due to an arthritis with thickened synovial membrane and the occasional exacerbations of pain and disability to an acute process. Sometime in July there were decided symptoms of a loose body in the joint, the prominent symptoms being "locking" with the arm in flexion and the finding of the body in the radial area posteriorly. On August 25th the patient consented to have the body removed, and so under chloroform anesthesia an incision was made on the posterior surface of the joint between the external condyle and the olecranon. No body was to be seen, but after considerable manipulation it was made to appear in the wound, and was extracted with the finger. Some clear synovial fluid escaped. The capsule was stitched with catgut, and a few strands of sterile gut were used for drainage, and the skin wound was closed with silk.

He recovered nicely from the operation, but the joint condition required treatment for some months. On June 7, 1895, he was discharged from treatment with function of the elbow almost completely restored. Extension was almost complete, with flexion to right angle with still some creaking in the joint on active motion in resistance and occasional "hurting." There had never been any trouble with this elbow previous to the injury. The specimen shown is a piece of the head of radius.

CASE 2. Wm. P., German, aged 35 years; occupation, blacksmith. Reported first about June or July, 1902, with a contusion over the inner condyle of the

left humerus. No evidence of fracture so far as crepitus was concerned. Under rest, hot fomentations, etc., he was able within a few weeks to resume his work. Occasionally he would meet me and remark that once in a while his elbow would hurt him.

In November, 1903, he came to my office with the statement that there was something loose in his elbow joint, and that every once in a while it would catch, pain him enough to make him "sweat," and that on examining the elbow he could feel the "lump" and could always by moving his arm and a little pressure release it. Elbow would be sore for a few days and then be all right. Continued at his work, part of the time as blacksmith and part of the time in general repair work on cars. By flexing the elbow and over-pronation the body was made to appear at usual site, radial side of joint behind, and using chloride of ethyl to freeze the area, I cut down over the body which slipped away, but with the assistance of the patient in manipulating the elbow, it soon re-appeared and was removed. Wound closed, sutured through and through with silkworm gut.

Recovery from operation was excellent, and in the course of a few weeks he resumed work, all pain being relieved and the movements of elbow, which had been somewhat restricted, fully restored. The injury was the result of being accidentally struck with a base-ball bat, which slipped from a player's hand and was, as a result, whirled with considerable velocity a distance of several feet before striking him. I am not positive as to the anatomic origin of this specimen, which appears to be facetted, but I think it to be from the internal condyle. There had been no trouble with this joint prior to the injury.

CASE 3. Henry M., German, aged 28 years; occupation, car repairer or carpenter. Reported June 22, 1904, for a sprain of right elbow joint, received while at work taking down an air-cyclinder for coal-

car, and had a bar placed between air-cylinder and the sill of the car, pulling down on bar when bar slipped, and let his arm change position suddenly "twisting" it at the elbow. After treatment for a few days the pain from the injury had sufficiently subsided so that he could return to his work. He was treated at this time for about two weeks, and then we saw no more of him for some time, when he came to the office and said that his elbow had hurt him, off and on, ever since he had "sprained" it, and that latterly, occasionally, while the elbow was always more or less "sore," the joint would catch while he was at work, and he would experience a sickening pain, and could then feel something in the elbow at back of joint. I advised him that it was undoubtedly a loose body, and would have to be removed before he could get well. I was unable by manipulation, passive or with the aid of the patient, to cause the body to appear at this time. All motion at the elbow joint was restricted and painful.

August 22, 1905, he made up his mind to have the body removed as the attacks of disability were becoming more frequent, and with chloride of ethyl freezing, an incision was made on the posterior surface of the joint on the radial side. With the elbow in flexion the body was plainly to be felt. Upon opening the capsule a smooth semi-elastic white body, the size of a small hazel-nut with no pedicle, appeared and was removed. The wound closed with silkworm gut suture including the skin and capsule. Dr. Lavender, who kindly examined the specimen, states that it is composed of typical hyaline cartilage, which had undergone extensive calcification, not true osseous formative changes, probably arising from the cartilage. No evidence of synovial villous structure was demonstrable. The outer margin of the section shows very slight amount of fibrous tissue, which apparently forms a very thin covering to the body. I had thought from

the appearance and semi-elastic feeling of this body that it had its origin in a synovial fringe.

From my own experience I am inclined to the opinion that traumatism plays a most important role in the causation of these bodies, and acts as a determining factor when the body is not immediately and entirely separated, in producing what Paget calls "quiet necrosis," which leads to the final setting free of the body. This was the condition I believe in Cases 1 and 2.

There is only one treatment for that condition, and that is removal of the body by an incision down over it, which in my cases was easily done. The operation is better done with local anesthesia, either freezing with ethyl chloride or the infiltration of a solution of cocaine, nirvanin, or Schleich's solution. In this way the co-operation of the patient is secured and is valuable. Dr. Thos. S. K. Morton's method, used in retaining loose bodies in the knee at the site of operation, namely, binding the flexed leg to the thigh with a bandage, can, I believe, be adapted to the elbow for the same purpose.

The after-treatment of the joint condition should be faithfully carried out, and for this the galvanic current passed through the joint, baking in hot-air oven, massage, and passive motion are to be highly recommended.

FRACTURES ABOUT THE ELBOW JOINT

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The region of the elbow holds an especial interest from a surgical standpoint in consequence of the frequency with which fractures occur in this locality and the somewhat doubtful outcome in any given case of injury. With the possible exception of the hip-joint, fracture about the elbow has caused more loss of sleep, and has been less remunerative to the surgeon, than any other class of injuries with which he has been confronted. The first essential to success in dealing with these cases embodies a clear conception of the anatomical structures entering into the formation of the joint.

The three great diagnostic landmarks of the elbow are the external and internal condyles and the olecranon process. They are on a common level when the arm is extended, and are invaluable aids in diagnosis, as they lie quite superficially and may be readily palpated although extensive swelling be present.

History of incidents relative to receipt of the injury, will materially assist in determining the probable presence and extent of fracture, but it must be fully considered by the examiner that its true value may be fixed in the diagnosis, as the same force which will produce fracture in one case will be followed by luxation in another, and by little or no inconvenience in a third.

Antecedent conditions have an important bearing on these injuries, as some persons have lax ligaments

and are frequently meeting with dislocations, while there are others who are particularly prone to fracture. In the former recurrence is liable to occur on removal of the dressings while in the latter delayed or non-union is present.

Methodical examination with the patient anesthetised, if instituted prior to extensive infiltration and swelling about the elbow, will usually result in a clear understanding of the nature and extent of the fracture; however, if the fragments are held in close relation by untorn periosteum or overlying ligaments the line of cleavage may wholly escape the finger of the examiner. Furthermore, slight separation of fragments may be accompanied by little impairment of function, absence of preternatural mobility, and crepitus. Pain about the elbow on pressure, following injury in the absence of dislocation, points to fracture, and if one cannot satisfy himself as to its presence the joint should be subjected to *x*-ray examination. The "tug-of-war" examinations yield little information, unnecessary pain if the patient is awake, and may result in irreparable damage to vessels and nerves. The gentle, educated touch of the experienced diagnostician will reveal much, but is insufficient in the class of cases under discussion, and few surgeons, indeed, will be content with the meagre data obtained by an examination which is obscured by resisting muscles, swollen tissues, and the complainings of the patient.

Etherization is the only fixed rule we follow in dealing with fracture about the elbow joint. This is seemingly imperative when we recall how infrequently fracture occurs singly in this region. We may readily discover a fractured condyle, but one should not be content to rest with this discovery, as the degree of force requisite in the production of condyloid fractures is of such magnitude that damaged vessels and nerves are rather the rule than the exception in this variety of injury.

To inspection, incidence of injury, comparison with uninjured elbow, and ether examination, the *x*-ray is a sort of supreme court to which appeal may be taken, but it must not be forgotten that here, as in law, that august body has on more than once occasion reversed its findings. Bone injuries contiguous to the joint, are often complicated by rupture of the overlying soft structures, and infection in varying degree is present. The best results are obtained in treatment of such injuries by carefully snipping off the soiled ragged ends of ligaments, fascia, nerves, etc., and suturing, after thorough cleansing with salt solution. Adequate provision for drainage must be provided in all cases of compound fracture. Kangaroo tendon or chromasized gut will serve the purpose of periosteal sutures, but many surgeons are still employing some variety of bone peg or wire to retain the fragments. Whatever method one selects it should be remembered that end-results will depend rather upon good ligament and fascia repair than upon absolute apposition and retention of bone fragments. The practice of dressing all fractures about the elbow, with the possible exception of fracture of the olecranon, with the forearm at a right angle to the arm, is a half confession that anticipates ankylosis, and, like many other fallacies handed down from a remote past, should be given over to ends which, primarily at least, know no such defeat.

Union of broken and torn tissues, and restoration of function are the great aims we have in view in dealing with fractures; hence it is all important that we bring to bear in the treatment of fractures those well known clinical and laboratory data which are being almost daily revealed to us.

Experiments in Loomis' laboratory demonstrated that healthy joints may be immobilized for a period of five months and full function regained on releasing them, but if the joint is so fixed as to cause the ends

of the bones to press on each other necrosis and ankylosis will follow, although the joint was normal when the experiment was instituted. Their observations confirmed an abundance of clinical evidence that injured or diseased joints soon become hopelessly locked if permitted to remain quiet. These experiments are cited to accentuate the folly of leaving an injured joint firmly fixed by dressings for any considerable period of time. Rapid formation of adhesions in the periosteum is a matter of common observation, and many devices and suggestions, including interposition of artificial periosteum, hypodermic use of eserine, and frequent changing of the patient's position, have been practiced to obviate their formation.

The little that is done to prevent gluing of tendons to their sheathes or bony union between joint surfaces, serves to show that the treatment of fractures about the elbow, with reference to the prevention of adhesions, has not kept pace with the application of surgical principles. Whatever line of treatment be primarily instituted the after conducting of the case should entail early massage and passive movement. Hitherto absolute rest has been deemed essential in the reparative process of bone, and blindly following this heritage has resulted in more locked elbow joints than injuries themselves. We learned the unsoundness of this teaching by observing those cases which are usually our most valuable studies, namely, patients who refuse to follow advice. Here repair of injury may be studied undisturbed by treatment.

We have recorded elsewhere the history of some cases of condyloid fracture in young subjects, six to eleven years of age, in which the patients were seen but twice, once at the time of injury and again some weeks later when they called to have the primary dressing removed. Function was but slightly impaired despite considerable deformity, and general results were infinitely better than in some other similar

injuries where treatment had been double-shotted by a long period of immobilization. Much is said in the lecture room and text-book anent the direction, degree, and continuation of force required to produce a given fracture. For instance, condyloid fracture is attributed to force applied to the under surface of the olecranon process.

In endeavoring to demonstrate the correctness of this theory, a 20 pound weight was placed on the arm of a cadaver near the shoulder in imitation of muscular resistance. The forearm was flexed to a right angle, and a sharp blow was delivered to the under surface of the olecranon. Fracture of the outer condyle followed in two instances, comminution of the olecranon in one, and oblique fracture through the middle of the humerus in one. In no instance was the internal condyle torn from its moorings. The force was gauged as evenly as possible, and but a single blow was delivered, with the exception of the instance where comminution of the olecranon followed a second blow, no damage having been produced by the first.

Fracture through the trochlea is associated with more damage to muscles, nerves, vessels, and ligaments than any other variety of injury occurring in this locality, in consequence of the great amount of force exhibited in its production.

Serious joint involvement is always present, extensive swelling rapidly follows, and gangrene may supervene from damaged circulation, i. e., compression from swelling or actual destruction of blood vessels.

The open method of treatment is to be commended in all cases of extensive joint involvement, and is especially applicable in the class of injuries to which reference has just been made. After freely exploring the joint cavity, freeing it from clot, removing detached spiculæ, and fixing fractured fragments, a strip of fascia from the arm may be inserted between the joint surfaces after the method of Murphy in excision or

the Mossig bone-filling may be used, with a view to preventing adhesions until sufficient repair has taken place to permit passive motion. The operation is completed by suturing the capsule, fascia, nerves, and skin with ample provision for drainage. The arm should be dressed in the fully extended position, placed on an incline, and a light weight applied. This position and dressing should be changed at the end of one week. After light massage the arm is redressed at a slight angle, and permitted to remain for four or five days, when it is changed to as nearly a right angle as possible without paining the patient too severely. Subsequent treatment consists of massage and passive motion every third day for a period of three weeks.

The time of operation is of much importance, but must be decided, as in many other conditions, by the man at court. Whether it is better to temporarily dress the injured elbow, apply ice, and temporize until swelling subsides, taking chances with inflammation, suppuration, and gangrene, or operate at once, is a matter for individual discernment.

The outer condyle, when fractured, is somewhat difficult to retain in place. In such case Kocher obtains good results by its removal. Fracture of the internal condyle is often complicated by rupture of the cubital artery and dislocation by rotation of the condyle on its axis from ninety to one hundred and eighty degrees, producing direct pressure on the ulnar nerve and impairing or paralyzing the flexors of the forearm. Removal of the internal condyle results in a helplessly crippled joint. If one is reduced to a choice, owing to inability to replace the fragment, ankylosis should be accepted in preference to excision. Excessive callus may be chiseled away and the nerve also freed after union of the fracture with encouraging hope of improving joint function and innervation of the forearm.

In dealing with fracture of the olecranon ligamentous union may be obtained by fixing the joint, preferably with the arm extended, for ten days and then employing light passive motion every third day for two weeks. This may appear iconoclastic, but experience has taught that ligamentous union here, as in no other bone, may so nearly fulfill the functional requirements of nice bone union that one may well question the propriety of assuming to improve on nature's plan.

Pain and swelling are dependent upon rupture of blood and lymph vessels, hence they will be greatest in those cases of fracture with widely separated fragments; and it is in this class of cases that pain is quickly relieved and swelling greatly curtailed by early replacement.

Much weight is given to crepitus, but the interposition of muscle, clot, fascia, or loose fragments will wholly obscure this symptom, prevent proper coaptation of fracture, and demand surgical intervention for their relief. Local pain and tenderness are given precedence over crepitus in the diagnosis.

The use of weights to overcome muscular rigidity permits of infiltration and diminishes elasticity, interfering, rather than assisting, in reduction of these fractures. The proper treatment of pain and swelling accompanying fracture is early reduction and the application of extension, ice, or other adjuvants deemed advisable.

Immediate amputation is reserved for those extensive crushing injuries, such as bumper wounds, in which the circulation and joint are so badly damaged as to be beyond all hope of repair.

In no other field in the whole domain of surgery does experience count for more than in the diagnosis and treatment of fractures about the elbow joint.

Finally, fractures about the elbow joint have been over-treated in the past.

DISCUSSION

DR. JOHN P. LORD, of Omaha, Nebraska.—I appreciate the fact that we have had a treat in this paper, yet we have not solved all of the problems that we shall be confronted with in the treatment of cases of fractures about the elbow joint. I have one suggestion to make, and perhaps it is in full corroboration of the doctor's statement, though perhaps I might add something to it. It is this: His last statement was that these cases in the past had been over-treated. I will confine my observations to the over-treatment which these cases receive in the matter of passive motion.

General surgeons throughout the country have learned something from orthopedists in the matter of passive motion in the presence of trauma. In these cases the origin of the arthritis is usually a trauma, and excessive passive motion, too early and too frequently used, perpetuates the arthritis. In the majority of cases this passive motion should not be repeated oftener than once a week, and sometimes not as often as that. Gentle manipulations, treatment of the muscles, and perhaps treatment of the swelling and infiltration by the use of hot applications, galvanism, etc., are beneficial; but the heroic means which these patients receive at the hands of those who are over-ambitious to restore function perpetuates rather than relieves the condition. I feel that there is a chance for great injury when passive motion is overdone.

DR. J. E. SUMMERS, of Omaha, Nebraska.—If I understood the essayist rightly, he recommended operative interference in these fractures about the elbow joint, and spoke of the danger of gangrene and suppuration. In a practice of twenty-five years I have never seen gangrene or suppuration following trauma of the elbow joint which was not compound, but I have seen suppuration and infection in the elbow and other joints where interference was attempted along the lines suggested. Of course, with our modern technic that is not to be expected. I believe that, in the hands of experienced men, a cutting operation is justifiable in this class of cases. In the majority of cases, however, it must be a rare exception where an open incision is justifiable. I have adopted the open incision in old cases, but never in a recent case, as I have not felt justified in so doing, and I have had a reasonable experience in the treatment of traumatisms of joints. Perhaps my experience will not allow me to criticize the great advantage which can be obtained by the open incision; still we know that by means of an open incision we can correct, replace, and in the greatest measure restore the normal re-

lations of the parts, one to the other. We also know that by the use of good tactile sense, good judgment, and experience, we can, in a great measure, produce the same results, and especially in those cases that are ambulatory, that can be placed under the x-ray; and I believe, as I have said before, it must be a rare case where open incision is justifiable. I think this association should go on record as against open incision in these cases, as a rule, or it should be undertaken as an exception in this class of injuries.

Dr. A. E. Benjamin, of Minneapolis, Minn.—I have been very much interested in this paper. At one time, when diseased tubes, ovaries and uterus, with adhesions and all complications, were treated by bimanual examination and replacement of the uterus with the use of pessaries, tampons, local treatment, etc., the gynecologist contended that he had benefited his patients, that after he had replaced the uterus the woman was better, and that a great many such women were cured. Since that time it has been found by experiments and operations that such was not the case; but that now we can do a laparotomy with good results, without danger, without infection, and with a positive cure.

Last year I read a paper on nearly the same subject as chosen by the essayist only I made it a little broader and more general, upon the treatment of fractures and sprains by the open method. If you will take pains to look up the literature of the subject and do a little work along the line the essayist has suggested, you will arrive at the conclusion that the proper thing to do is to treat many of these cases by the open method, and this should be instituted as early as possible, providing you are not sure that everything is in place. The fascia you must consider; the soft structures you cannot see by the x-ray; nor can you always demonstrate this position by manipulation. It is just as reasonable to suppose you can cure retrodisplacement of the uterus, with diseased tubes and ovaries, by a pessary and by applications locally directed, as it is to treat many of these cases of fractures by cast or splint. This is a broad statement to make, but I am sure the time will come when we shall all be of the same opinion in this matter.

Why should we get more infection by operating on these cases than in doing laparotomies? If infection occurs, I should say it is largely due to carelessness and unpreparedness of these patients locally and to faulty technic. Where we can institute operative interference early, remove the exudate, which, sooner or later, becomes organized with the

production of new bone tissue, and get rid of the enlargement in and around the joint, relieving the pressure upon the soft tissues, we can get a more useful joint also by preventing organized exudate, by stitching the soft structures together, making the planes of fascia, periosteum, nerves, and arteries come parallel, and by putting in slight drainage for the removal of the exudate.

Dr. Charles H. Mayo, of Rochester, Minn.—I would like to go on record with reference to the operative treatment of fractures in the region of the elbow joint. I believe in it. We practice this method more than we used to.

I would divide these cases into two classes, the adult and the child. In the adult, if I can see the fracture before there is swelling, the result of continuous hemorrhage from the marrow, and effusion, which is going to distend the joint tissues, holding the arm in a position of deformity or stiffness, and can feel the fragments and can operate inside of the first day after the injury, I would not hesitate to remove any loose particles from the joint in an adult, but seldom from the joint of a child, because it might interfere some with growth, and children have great reparative power.

With reference to the time the operation is to be made; if you operate early before the results of the traumatism appear, say in the first day, then it is all right, and probably you will not get suppuration if you drain. If you operate when there is intense congestion and effusion— on the third or fourth day—there will be a certain percentage of unavoidable suppuration, because the parts do not offer resistance until the lymphatics pick up the coagulated exudate. If you wait until the ninth day the bones begin to knit. If you operate previous to that time you must choose some method to hold the bones in position. If at the end of two weeks, you have only to place the bones in apposition to have them unite.

Dr. E. O. Jones, of Murray, Utah.—In my experience with fractures of the condyles of the humerus, so far as the final functional result is concerned, it makes no difference whether passive motion is instituted early or late, or at all, if the fractured fragments have been accurately replaced and kept in that position. But in those cases where the fragment has slipped away, as it so frequently does, in my experience passive motion, either early or late, will not effect a good result.

As to reduction of the fractured condyle: In a recent or fresh fracture it has not been an easy matter for me to hold the bone in position by the ordinary means; but a method

which I did not hear the essayist mention, has given most excellent results in my experience. The method which I have used was devised by John B. Roberts, of Philadelphia. It consists of the subcutaneous nailing of the fractured condyle to the shaft of the humerus with a fine steel nail, provided with a long square head, which will facilitate the removal of the nail afterwards.

I have used this method in over twenty cases—nearly thirty cases—with uniformly good results. With this nailing I find it makes no difference in which position the arm is dressed, or whether any splint at all is used, or whether passive motion is instituted afterwards or not. So in these cases the important point is to secure permanent, accurate replacement of the fractured condyle.

Dr. Miles F. Porter, of Fort Wayne, Ind.—I wish to ask, what are you treating these joints by the open method for? The burden of proof will rest with those who do that, and they must show that this method gives better results than the methods of those who reserve the open operation only for exceptional cases. Personally, I must say that in my experience, which covers quite a number of these cases, I have never had any occasion to open the joint, nor have I seen a useless joint as a result of the closed treatment.

One point that struck me during the reading of the paper and in the discussion was the fear of infection that seems to possess the advocates of the open method. This fear must exist, else why do you drain? If there is no danger of infection, I maintain that without drainage the patient is better off. If there is danger of infection, in proportion as that danger is great we ought to guard against the possibility of it by keeping the joint closed until there is absolute necessity for opening it. I am opposed to the doctrine that the average fracture about an elbow joint should be treated by the open method, because by the closed method the results are quite as good, if not better.

Dr. S. C. Baldwin, of Salt Lake City, Utah.—I agree in the main with what Dr. Porter has said, namely, that while the open method of treating fractures is desirable in some cases it is very seldom that it is the best method. But even in children, speaking along the line of the remarks by Dr. Mayo, it is, once in a while, necessary to open up the elbow joint for the treatment of a fracture. I recall a recent case in a child about 18 months old in which the external condyle was split off and drawn down to such an extent that the fragments were separated for at least an inch and a half.

The result was that if the fragment had not been replaced pronation could not have taken place. It was impossible to do anything except by the open method. I cut down on to the elbow, drew up the fragments, being able to do so only when the arm was flexed, and stitched it to the other fragment of the humerus. I then closed the wound entirely, and the child has perfect motion in that elbow joint, so far as I am able to judge. I believe one of the principal functions of that elbow would have been destroyed had not this fracture been treated by the open method. So, while, as a rule, I am opposed to the open method for recent fractures, I believe, even in children, a case will now and then occur when it is necessary to resort to it.

DR. HAINES (closing the discussion).—I wish to thank the members for the kindly reception they have given my paper. I believe most, if not all, the objections to the open method of treatment have been answered by those who followed in the discussion.

The principal objection of those who dissent from the views expressed in the paper are founded on fear of infection. This same factor deterred men but a few years ago from opening the peritoneal cavity. To-day we think little more of entering the peritoneal cavity, if essential to the welfare of the patient, than of making a skin incision. Indeed, so much time and attention have been directed to surgery of the abdomen, chest, and head, that the joints themselves have been sadly neglected. I take it from some of the discussion that there are some men who, if they had opened a joint, would not rest well that night.

A surgeon should run no more risk and encounter no more difficulty in doing clean thorough work around an elbow joint than in any other locality. It is no longer a question whether we carry infection in operative work, but, rather, to reduce operative infection to a minimum. Unfortunately, in joint surgery, we have not a friendly ally in the synovial membrane possessing the degree of potency for destroying bacteria that is present in the peritoneum, hence the necessity for drainage.

Perhaps I did not make myself clearly understood with regard to one point. The paper does not advocate the open method in all varieties of fracture about the elbow. This treatment is reserved for those cases of condyloid fracture with extensive joint involvement, ruptured ligaments, damaged vessels and nerves, effusion clot, etc. These are the cases in which I have been advocating and employing the

open method the same as you would advocate a similar method in the treatment of ectopic pregnancy or any condition which demands surgical interference for its relief.

With reference to early, rough passive motion, no sane man is going to add insult to injury in the treatment of fractures in this locality or elsewhere. Light massage, the application of heat, and various other measures, including position, the patient's comfort, etc., are only to be mentioned in the time allotted with the hope that they will be employed in an intelligent manner.

I cited experiments showing that healthy joints may remain fixed almost indefinitely without abolishing function, whereas a diseased joint soon becomes hopelessly locked so that light massage and passive motion are to be employed early if we would avoid ankylosis.

TUBERCULOSIS OF BURSAE AND TENDON SHEATHS

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These diseases are sufficiently common in this part of the world to deserve attention, and they need such attention all the more on account of the lamentable results which follow lack of diagnosis and the consequent bad treatment. Simple incision with subsequent infection of a tubercular tendosynovitis has been an entirely too common and disastrous error in the practice of even quite eminent surgeons. It seems quite possible for either of these lesions to be the first tubercular process to appear in an individual, but such patients usually develop later other tuberculoses.

The localizing causes of these tuberculoses are hard to determine, and so the classical explanation of a locus resistentiæ minoris, due to a slight injury, forming a nidus for the growth of the tubercle bacilli must be accepted in lieu of a more precise explanation. The most tenable hypothesis as to the origin of all local tuberculoses is that there is first established a tubercular adenitis with areas of caseation from which the tubercle bacilli gain access to the general circulation, and so are carried to regions where slight injuries and extravasations of blood favor their lodgment and growth. This view must be modified to a certain extent to reconcile it to the results obtained by Ravenel.* He fed dogs upon butter mixed with a

*"Relation between Human and Bovine Tuberculosis," M. P. Ravenel, Vol. 29, pp. 34 and 35; Translations American Public Health Associaton, 1903.

pure culture of tubercle bacilli, and was able to recover the bacilli from the thoracic duct. This throws new light upon the problem of infection with tuberculosis, making it possible for tubercle bacilli in food to stand in an etiologic relation to general or distant local tuberculoses without tuberculosis of the alimentary tract and without tubercular adenitis.

Although it must be admitted that it has been thus demonstrated that tuberculosis in its various forms may arise directly from the entrance of tubercle bacilli into the circulation from the intestinal tract, still the ingestion of food containing tubercle bacilli is, fortunately, not a common occurrence, but a very rare one. On the other hand the lack of sanitation against tuberculosis leads to the respired air being often loaded with tubercle bacilli, which, lodging on the mucous membranes of the respiratory tract, may be carried to a lymph node and there set up a tubercular adenitis. The bronchial and cervical lymph nodes in this way may become the common primary locations of tuberculosis, and later, by their caseation, stand in a causal relation to other local tuberculoses.

Pathologically, tubercular bursitis and tendosynovitis may occur in three distinct forms, differing considerably in their gross and microscopic appearances, but less in their clinical symptomatology. In the first and most common form there is a distension of the bursa or tendon sheath by serum, accompanied by the presence on its walls and free in its cavity of numbers of the so-called "rice-bodies or melon-seed bodies." With these is more or less thickening of the sac-wall by fibroid tissue with rarely areas of caseous degeneration. In the second form the cavity is lined with a thick layer of tubercular tissue, which resembles ordinary granulation tissue in its gross appearance, but which microscopically shows tubercles and areas of caseous change. The amount of caseation varies

in different cases and with the acuteness of the process in any given case, the more acute and rapidly progressing cases giving the larger amount of caseous material. The fluid in these cases is moderate in amount and may be serous, bloody, or pseudopurulent in character. Such a tubercular process is apt to spread from its original location to the contiguous structures, and thus infect fasciæ and joints. In the third and rarest form there is great overproduction of fibrous tissue, causing massive thickening of the wall of the affected cavity. This new fibroid tissue seems macroscopically normal, but the microscope usually, and animal inoculation regularly, show it to be tubercular. Its amount varies with the chronicity of the case, being largest in amount and most perfectly developed in the most chronic cases, representing nature's response to the long-continued irritation caused by few or non-virulent bacilli.

In tendosynovitis the tendons are affected differently in the three forms of the disease. In the first form they remain unimpaired, for a long time, but ultimately are attacked and destroyed. Early diagnosis and treatment in this form of the disease ensure dealing with at least comparatively healthy tendons. In the second form the tendons are attacked very early and become covered with tubercle tissue, which penetrates into their substance, forcing apart the fibres and gradually turning them into a pulpy mass, a condition often resulting in spontaneous rupture. In the third form the tendons may or may not be involved early, but regularly are so at some time, becoming thickened and firmly anchylosed to their thickened sheaths. This third variety of tubercular change is very rare in the tendon sheaths, even in comparison with its occurrence elsewhere, it being in all locations the rarest of local tuberculoses.

Location.—While these processes may spring up at any anatomically suitable point, practically the tendon

sheaths are attacked very rarely, except in the hand and wrist, there being little choice between the extensor and flexor tendons. Rare locations are the sheath of the tendo Achillis, the hamstring tendons, and those about the shoulder-joint. Bursal tuberculosis is much less closely limited, being possible in any bursa normally situated or acquired, but most common in bursæ which are the more ordinary seats of other forms of inflammation. The prepatellar bursa naturally leads in frequency of tubercular involvement, followed by the olecranon bursa. Other bursæ rarely involved by simple inflammations, are not infrequent sites of tuberculoses, as the subdeltoid bursa at the shoulder and the subpsoas and gluteal bursæ at the hip. Such lesions about the hip and shoulder are important because they may, when neglected, involve the adjoining joints.

The symptomatology of all three forms of disease varies very little. The presence of an indolent doughy swelling at a bursal site or over a tendon sheath leads to a suspicion of tuberculosis, which is confirmed if the presence of rice-bodies can be determined by palpation. Local and general afternoon rise of temperature and the presence of tuberculosis elsewhere strengthen the diagnosis. The use of tuberculin injection for diagnosis will rarely be advisable in these cases, as exploration with the knife is both more certain and greatly safer.

The prognosis as to life is good where appropriate treatment is promptly instituted, but these lesions share with other local tuberculoses the dangers of dissemination, and the great probability of being only secondary to other more important changes. The prognosis as to the restoration of tendon function varies in the three varieties of the disease. Early operation gives good functional results in the first and third varieties of the disease, but can rarely do

so in the second where the tendons are generally impaired very early.

Treatment.—The ideal treatment of any local tuberculosis is the complete excision of all tubercular tissue and the closure of the operation wound for union by first intention. This result can be obtained in a large percentage of cases of tuberculosis of bursæ, and no other treatment should be considered where excision can be accomplished. In the case of deeply placed or inaccessible bursæ, incision, curettage, carbolization, and packing with iodoform gauze is the method of choice. In tuberculosis of the tendon sheaths the preservation of tendon function becomes the first consideration and must modify the operation. In all cases the ideal procedure is complete excision of the whole tendon sheath, and the formation of a new sheath by blood clot organization. As most of these lesions are located about the wrist, involving the numerous and complicated tendon sheaths there present, a total excision of the disease becomes a quite formidable proceeding, and the result of any error in aseptic technic disastrous.

In view of these facts and the unfortunate results too often observed after incomplete or unskilled attempts at excision, some less formidable substitute is much to be desired. Several methods have been extensively exploited and have attained varying success. The injection of iodoform emulsion into the aspirated cavity has probably enjoyed more popularity than it deserved, and is now seldom used. A most efficient substitute for excision, and one, on account of its ease of execution and the satisfactory results obtained, oftentimes to be preferred to the more formidable operation, consists of a free incision, which exposes the full extent of the disease; the removal of all rice-bodies; the soaking for at least one minute of the whole interior of the tendon sheath in ninety-five per cent carbolic acid followed by alcohol; and the suture

of the sheath and overlying structures separately without drainage.

Such treatment is only applicable to the first variety of tubercular tendosynovitis, but as this comprises the great majority of observed cases, and as the results seem to be equal to, or even more favorable than, those obtained by complete excision, the procedure has certainly much to recommend its adoption in all suitable cases. As an illustration I can report a very extensive tubercular tendosynovitis of the flexor sheath of the right hand in a laborer of 36. The patient had a caries sicca of the right shoulder and a tendosynovitis, as noted with no other tubercular lesions demonstrable. The thecal swelling extended from three inches above the wrist down to the base of the little finger, and rice-bodies could be easily felt and pushed from the palm to the arm, giving the usual creaking and crepitation. There was complete disability, the patient being unable to close the hand or to hold objects securely.

An incision was made into the distended sheath in the forearm, and later extended through the anterior annular ligament into the palm, and a large number of rice-bodies evacuated, after which without curetting ninety-five per cent carbolic acid was freely used, neutralized, and the wound sutured in layers and put up in plaster-of-Paris. Union was prompt, and there has been no recurrence after four years. The function of the hand is good, and there is no evidence of former disease, except inability to completely flex the little finger. The man uses his hand constantly in heavy labor, and when I last saw him he was wheeling a barrow without discomfort.

The *x*-ray treatment bids fair to be of considerable benefit in these cases, but cannot remove rice-bodies, and it also tends to increase connective-tissue change, and hence may prove damaging in tendon-sheath tuberculosis by favoring dense adhesions.

Bearing upon the question, whether these local tuberculoses can be the only expression of the disease, I show you a photograph of a rare case of tubercular bursitis illustrating the process of formation of the rice bodies in the first variety of the disease. The case is doubly rare because the disease occurred in a robust woman of 30 without other demonstrable tuberculoses and because it was situated in an adventitious bursa. The patient was five feet seven inches tall and weighed about one hundred and eighty-five pounds, and was a picture of robust health. She had been a teacher of physical culture, and had done various athletic stunts upon the stage, during which she had worn high, laced shoes, to which she attributed her trouble. This was a slightly painful swelling over the middle of her left shin and another soon after over her right knee-cap. Examination within a few weeks after she first noticed the swellings showed a boggy, indistinctly fluctuating swelling over the middle of her left tibia, which on palpation gave the sensation common to rice-bodies. The swelling over the right knee was a moderately enlarged, tightly distended prepatellar bursa. There was slight local heat and tenderness over both swellings, but her general temperature was normal, and a careful examination by the dispensary internist failed to discover any other tuberculoses. Her general health appeared perfect.

Operation showed that there was an adventitious bursa formed at the expense of the deep fascia at the middle of the left leg. This was filled loosely with clear serum, and contained a moderate number of loose rice-bodies, while its walls were thickened, red, and studded with polypoid outgrowths resembling the rice-bodies in section and apparently identical with them in every way except their local attachment. The prepatellar bursa was found in exactly the same condition, except that it was more tensely filled with serum. Both were excised and the wound closed

without drainage, with prompt primary union. The patient is still alive and well after three years, and has developed no tuberculosis of any kind.

I have thought this subject worthy of presenting to this Society because—

First. The conditions considered, while relatively rare, are sufficiently common to deserve attention.

Second. Correct diagnosis and proper treatment are imperatively demanded to avoid disaster.

Third. Excision and primary healing is the ideal operative procedure in all cases.

Fourth. Incision, evacuation, carbolization, and primary union can be substituted for the excision in many cases of tendosynovitis with equally good, or even better, results.

APPENDICITIS, WITH FURTHER REPORTS FROM PHYSICIANS WHO HAVE SUFFERED FROM THE DISEASE

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While appendicitis is probably encountered by all of us more frequently than any other surgical condition, and while no other branch of surgery of equal importance can show such a large amount of uniformly good work and from the hands of so many men, and while we are practically agreed as to the pathology of the disease, as well as to its diagnosis and treatment, in its various stages, I feel that the few unfortunate and disappointing cases which all of us are occasionally called upon to treat is sufficient apology on my part for coming before you with a paper on appendicitis. In our eagerness, however, to report our favorable results we have probably not dwelt sufficiently on diagnosis, both in chronic and in the *early* stages of acute cases. The diagnosis and operation of all chronic and interval cases would soon make acute cases very rare, and the early operation of all acute cases would soon leave us almost without mortality in this disease. The fatalities of the present time are largely confined to cases where, either from mistake or of necessity, operation is delayed too long.

The diagnosis of acute appendicitis at the present time is not a difficult task for the average practitioner of medicine. Given, a patient in usual health who has suddenly become ill and is suffering from severe colicky pain in the abdomen, at first general, or in the epigastrium, and within a few hours becoming local-

ized, usually in the right iliac space, with more or less tenderness on gentle or deep pressure, some rigidity of the right abdominal muscles, possibly a slight rise of temperature, with nausea and perhaps vomiting, a firm, bounding, and rapid pulse, and a "peritoneal" expression, one of experience will not hesitate to make a diagnosis of acute appendicitis of a serious character. These symptoms will not all be present in all cases, or in scarcely any one case, but will be to an extent sufficient to produce upon the experienced mind the acute "appendiceal" picture.

The symptoms in chronic cases do not appear to be nearly so well understood. It is not necessary that one should have had a recognized severe acute attack in order to reach the chronic state, or that he should have had an attack at all. It is possible for an ulcerated or chronically inflamed condition to exist for months or even years before it would lead up to an acute attack, and many who have had large experience in appendicitis work believe that practically every acute case has had its chronic stage presenting prodomic symptoms which should have led to a diagnosis and, in many cases, to *operation* without having had an acute attack, or with having had only occasional mild catarrhal or colic attacks. The more frequent symptoms are chronic indigestion, usually with much gaseous disturbance and with frequent colicky pains, in many cases general, but more often in the right iliac space, or referred to the opposite side of the abdomen. These patients usually suffer more or less from constipation and from so-called intestinal indigestion, and are nearly always immediately relieved by the action of a cathartic, only to have a return of the symptoms on overindulgence in food, or on partaking of some article of food which cannot, by them, be easily digested. As the case progresses tenderness is frequently, though by no means always, noticed in the region of the appendix, usually on deep pressure. When this is the

most constant symptom, concretions are apt to be found in the appendix, though in some cases tenderness would appear to be due to adhesions which have formed slowly and which prevent the free movement in the abdominal cavity of the appendix during the contractile movements of the bowels, thereby proving a continuous source of irritation. An accumulation of feces in the colon may hold back gas, and cause the cecum and appendix to become over-distended, and in this way help to produce the tenderness, but in such cases the first effect would be the colicky pains, and the tenderness should follow for a short period only, after the constipation has been relieved.

A closer study of all our stomach and intestinal indigestion cases will show many of them to be cases of chronic appendicitis, and will lead to the application of the recognized curative treatment in the safest possible stage of the disease.

Many, in fact, nearly all, of the symptoms of chronic appendicitis may be termed prodromic symptoms of the acute stage, as it is from these chronic cases we more frequently get our acute cases with sudden and severe onset. This is not universally true, however, for occasionally we get a fulminating case where we are unable to get a previous history of an attack, or of any symptoms of a chronic condition.

Acute cases should always be operated upon at once if they are within reach of good surgical aid. If not, they should be treated by the starvation method, and the attempt be made to bring them to the interval. Neither light nor liquid diet should be used, but *absolutely* no food should be taken by mouth, and the average case need not have more than two or three ounces of some one of the predigested foods, which are on the market, diluted with as much normal salt solution and given by bowel every four hours. This will suffice for both food and drink. The lower bowel should first be emptied by a small enema, and the

Fowler position will drain the stomach and make stomach-washing unnecessary, as well as drain any infective material to the lower abdomen, the part of greatest peritoneal resistance. A swing constructed of a board three inches wide and two and one-half feet long, with two small ropes attached to it and to the head of the bed and pillow, will support the patient, and make the position comfortable. Probably about eighty per cent of acute delayed cases can be brought to the chronic or interval stage by this method, but this plan of procedure should never be adopted as a substitute for good surgery, if the latter is available. By early operation with good surgical surroundings there will be practically no mortality. The eighty per cent who reach the interval state by the Ochsner method may also be saved by operation in the interval, yet twenty per cent have fallen in the attempt to reach this stage who might have been saved had surgery been available. The profession is now practically a unit in favor of operation, preferably early, and the public is fast becoming educated to this view.

Few, if any, interval cases should be allowed to go without operation. The ones not operated upon should be limited to those in which there is good reason for fearing a short anesthesia and a rapid operation, and these are very few.

Some time ago I gave a synopsis of a brief report of 100 physicians who had suffered from appendicitis, together with a few facts of interest gleaned from these reports. Since then I have collected the reports of 40 more physicians who have suffered from the disease, and I will give you here a few facts obtained from these reports. The 140 cases had 490 attacks, 40 had only 1 attack, and the 100 had 450 attacks. Eighty-five had premonitory symptoms of greater or less degree. The most prominent symptom in the beginning of the attack was pain of a colicky nature. This was general or in the epigastrium at first, and

later became localized in the region of the appendix. Nausea and vomiting appear to have been present in the more serious cases, but in many it was not mentioned. One hundred and twenty-nine cases were operated upon. The prevailing treatment in the 450 attacks before operation was the mixed treatment, some food being allowed by mouth and some cathartics being given. Next to this the Ochsner, or starvation, treatment. It was interesting to note that in many cases while in answer to the question, "How were the attacks which were not operated upon treated?" the mixed treatment was given, yet in answer to the question, "What do *you* advise in cases not operated upon?" the answer the Ochsner, or the starvation, treatment was given. Many of these attacks were treated before the most excellent method of Dr. Ochsner for the treatment of delayed cases was brought out. Fifteen of these cases mention sequelæ, mostly slight hernia, and these were in drainage cases. One hundred and twenty advise early operation, 3 do not, and 17 give explanatory answers which could not be placed in either class. One hundred and two think diagnosis can be made within the first twenty-four hours; a few think not; and the remaining ones did not answer the question at all, or gave answers which could not be placed in either class.

The 100 surgeons who so kindly furnished me the names of physicians who had suffered from appendicitis, by their answers to the questions propounded, show that the *surgical* profession are practically agreed on all phases of the subject.

In conclusion, I would urge the watching for premonitory symptoms, as I believe them to be present, to a greater or less extent, in a large majority of cases. This would lead to an earlier recognition of the acute attack, if not to a diagnosis of the trouble in a chronic stage, and would thereby lead to operation in all cases, and consequently to a much lower mortality-rate.

The few following abreviated reports of physicians who have suffered from appendicitis may be of interest:

No. 20. Dr. G. A. Harlow, Milwaukee, Wis. Operated upon by Dr. Mayo, Rochester, Minn. One attack. Had numerous spells of what was supposed to be intestinal indigestion between the years 1889 and 1895. Attack was preceded by distress in stomach, constipation, followed next morning by slight rise of temperature, pulse from 100 to 110, soreness, and uncomfortable feeling in right iliac fossa, later pain on deep pressure, and marked muscular resistance on right side. Treatment, rest in bed, low diet, poultice on abdomen, bowels moved by enemata, symptoms subsided in two weeks. From this attack to 1904 suffered occasional attacks of intestinal indigestion and colitis. These attacks were preceded by nausea, distress in the right iliac region, intestinal cramps, and some diarrhea. Usually subsided in twenty-four hours without going to bed by eating practically nothing and taking bismuth. Had frequent attacks of colitis. Consulted Dr. Mayo, who gave the opinion that intestinal trouble was due to the appendix, and operated September 6, 1904. Appendix was found curled upon itself, covered with adhesions, and closely bound down to the ileum, was constricted in the center by apparently recently formed adhesions. In bed eight days, out on the tenth day, and returned to work the twelfth. Steady improvement ever since.

No. 15. Dr. E. D. Arnold, Omaha, Neb. Operated upon by Dr. C. C. Allison, Omaha, Neb. Four attacks, first in 1892, suffered pain in lower right side of abdomen, little vomiting, lasting one day. Did not then even think of appendicitis, but attributed the attack to indiscretion in eating and over-exercise. In 1885 became drenched with a cold rain, chill following. Moderate pain followed this over the entire abdomen, not severe, but more of a distressed feeling, lasting

several days. December, 1895, severe attack came on with sudden severe pain, slight rise of temperature, and constipation. Appendicitis was diagnosed, remained in bed several weeks, seemed to recover perfectly from this. In April, 1897, had a more severe attack, symptoms as in former attack. Remained quiet until the acute symptoms had subsided, then had the appendix removed. Recovery uneventful, and have had no trouble since.

No. 14. Dr. N. W. Moore, Cynthiana, Ky. Operated upon by Dr. B. M. Ricketts, Cincinnati, Ohio. Nine years ago. Many attacks. Suffered from a constricted sensation over McBurney's point and extending down to the inguinal region, symptoms at times resembling those of hernia. Nausea and sometimes vomiting, constipation, slight fever, and tenderness and rigidity in right abdomen were the principal symptoms. Pain never severe, more or less indigestion for twelve years prior to operation. Has some indigestion since operation. Premonitory to the attacks indigestion, fullness of stomach, belching, and restlessness. At the beginning of the attack pain over the appendix, and nausea with a burning and constricted feeling at McBurney's point.

No. 12. Dr. R. H. Rice, Kewaunee, Wis. Operated upon by Dr. Oviatt, Oshkosh, Wis. One attack. Attack was brought on by violent gymnastic exercises, was thought to be a strain at the time. Premonitory symptoms, indigestion and constipation, tenderness, more marked on pressure. This continued for two years, gradually growing worse when a diagnosis of chronic appendicitis was made, and the appendix removed. No sequelæ.

No. 11. Dr. John M. Foster, Denver, Colo. Operated upon by Dr. Chas. A. Powers, Denver, Colo. First marked attack nineteen years ago. Several attacks since. Early symptoms in each attack, pain followed by tenderness in the right side. Premonitory

symptoms, dull aching pain, so annoying at times as to prevent sleep unless opiates were taken. There was also a catarrhal colitis present. Operated upon April 12, 1904. Since then has gained weight, and the colitis and other symptoms have disappeared.

No. 10. Dr. Arnold Stedman, Denver, Colo. Operated upon by Dr. Chas. A. Powers, Denver, Colo. Two attacks. First attack April, 1903, slight, at home five days. Premonitory symptoms, anorexia and nausea, feeling of inactivity in bowels, at onset of attack colicky pains, and in a few hours pain settled to McBurney's point. Treatment, cathartics, hot bath, and nothing but hot water in stomach for three days. Second attack September 3, 1903, awoke with a chill, having slept in a draft had a sharp burning pain in the region of the appendix, attended by marked symptoms of shock. Was operated upon within two hours. Appendix was found perforated at its base, with more or less leakage of intestinal contents. Drainage was necessary. Good recovery, has a slight hernia at point of drainage.

No. 9. Dr. H. M. Brown, Milwaukee, Wis. Operated upon by Dr. F. E. Walbridge, Milwaukee, Wis. Had one attack, operation within three hours of the onset of the attack. Premonitory symptoms, fourteen hours before attack there was a marked nervous depression. For about a year at intervals there was a feeling of uneasiness in the right iliac region, but no pain, onset of attack was sudden with general, severe pain, increasing in intensity, nausea, intense nervousness, with tenderness over appendix. Good recovery. Some trouble with nervousness since, but other symptoms have disappeared.

No. 8. Dr. Guy C. Rich, Sioux City, Iowa. Operated upon by Dr. Van Buren Knott, Sioux City, Iowa. Four or five attacks. Attacks came on with general abdominal pain, with paroxysms of intense pain, followed by tenderness in abdomen. Neither

pain nor tenderness over appendix until the fall of 1903, when tenderness developed over appendix. Another attack in February, 1904, left the appendix very tender. Was operated upon soon after this attack had subsided. Perfect recovery. No sequelæ.

No. 7. Dr. J. P. Houston, Chicago. Operated upon by Dr. N. Kerr, of Chicago. First attack April, 1889. Premonitory symptoms, about four days of malaise, prior to severe pain. Constipation for a day or so, painful micturition two days before attack. Discomfort about stomach with loss of appetite, gradually developing into a more or less general abdominal aching, succeeded by onset of sudden violent pain. Subsequent attacks had symptoms very similar with increased tenderness on pressure. Operated upon July 18, 1903. In bed five days, left hospital eleventh day, stitches removed the fourteenth day. Left for vacation two days later, went rowing three days later, rowed several miles daily.

No. 5. Dr. F. H. McCray, Schaller, Iowa. Operated upon by Dr. Van Buren Knott, Sioux City, Iowa. One attack. Premonitory symptoms, dull persistent general pain for two weeks before attack. Pain grew gradually more severe and tenderness more marked and became localized in region of appendix. Remained in bed several days and took opiates, some tenderness continuously until operation, which was four months later. Perfect recovery. No sequelæ.

No. 4. Dr. W. L. Curtis, South Omaha, Neb. Operated upon by Dr. B. B. Davis, Omaha, Neb. Three attacks. Premonitory symptoms, dragging or pulling sensation with pain in right iliac region, followed by nausea with increasing pain and tenderness. Treatment in first two attacks, rest in bed, cold applications, no food, no medicines. Operated upon during the third attack. Health good since operation. Thinks impossible to know from symptoms what conditions exist in abdomen.

No. 1. Dr. Otis B. Wight, Portland, Oregon. Operated upon by Dr. K. A. J. McKenzie, Portland, Ore. One attack, began at night with general malaise and a feeling of distension and uneasiness in abdomen, mainly in epigastrium. Nausea, vomiting, and severe chill next morning, followed by another chill later in the day. Slight tenderness on deep pressure in right iliac fossa, becoming more prominent in afternoon. No colic, no sharp pain, or rigidity of abdominal muscles at any time. Treatment, ice-bag to side, rest in bed, nothing by mouth. Symptoms subsided entirely by fourth day, except slight uneasy feeling over McBurney's point, which continued until operation, which was on the seventeenth day. Appendix inflamed, almost perforated, and surrounded by dense adhesions. Convalescence uneventful. No trouble since.

No. 2. Dr. W. J. Bussey, Sioux City, Iowa. Operated upon by Dr. Van Buren Knott, Sioux City, Iowa. Had two attacks, first attack began with sudden, sharp, cutting pain in the right iliac fossa, very severe for two hours, then gradually subsided. Treatment, rest in bed for ten hours, milk diet. Was operated upon at the beginning of the second attack, which came on more gradually, pain not so severe but lower down, tenderness and sense of fullness over appendix was constant and marked. Appendix was long, and tip was adherent to bottom of pelvis. Back at work in fifteen days, and in perfect health ever since. He says, "Most emphatically advise early operation and no medical treatment, if competent surgeon can be had."

No. 30. Dr. G. Frank Lydston, Chicago. Operated upon by Dr. R. T. Morris, New York. Had two attacks. La grippe and general malaise preceded first attack. Onset was sudden and severe. Treatment, starvation plan. Operation early in second attack. Good recovery and no sequelæ. Advises early opera-

tion, should rarely temporize, recommends starvation treatment, if operation is impossible.

No. 29. Dr. A. H. Van Duyn, Hill City, Kan. Operated upon by Dr. Potter, St. Joseph, Mo. One attack. Premonitory symptoms, two months previous to attack felt occasional sharp pain about appendix, especially when coughing or sneezing. Symptoms at beginning of attack, severe cramping pain at sternum and over abdomen. In six hours pain and tenderness was localized over appendix, rise of temperature to 104°, rapid pulse. Was ill eight days. Operated upon two months later, good recovery, no sequelæ. Advises operation as soon as possible in most cases, and Ochsner treatment where skilled surgeon cannot be had.

No. 25. Dr. G. D. Brannan, Crown Point, Ind. Operated upon by Dr. Ochsner, Chicago. Had six well marked attacks, and several mild attacks supposed to be biliousness or indigestion. Onset of marked attack, pain in region of umbilicus, followed by nausea and vomiting, pain becoming more general, in a few hours localizing in region of McBurney's point, slight rise of temperature, with rigidity of right rectus muscle. Treatment in these attacks, rest in bed, restricted diet, laxatives, moderate use of morphine hypodermically. Operated upon in sixth attack. Since operation has been free from biliousness, "which formerly confined me to bed for a week or ten days at a time." Advises no medical treatment, if good surgery is available; otherwise the Ochsner treatment.

No. 23. Dr. R. C. Dugan, Eyota, Minn. Operated upon by Dr. Mayo, Rochester, Minn. Had a great many attacks when a child, which were not diagnosed, but which he now knows were appendicitis. At about eight or ten years of age attacks ceased and had no more trouble until the winter of 1900 when he was doing a great deal of hard riding. Began to have soreness and occasional sharp pain in appendix region.

Pain continued until March of that year, when appendix was removed. Had no typical acute attack from childhood until operated upon. Symptoms ceased with operation.

No. 27. Dr. F. P. Hulan, Pond Creek, O. T. Operated upon by Dr. Ochsner, Chicago. Two attacks, both mild. First attack was twelve days before operation, second attack two days before. The most pronounced symptoms for a year and a half before operation were heavy feeling with gaseous distension of abdomen, some tenderness at McBurney's point, varying from mere sensibility to soreness for a year and a half before operation, and would occasionally last all night. Headaches, variable appetite, and indigestion. Advises early operation, if possible; otherwise the Ochsner fasting treatment.

No. 26. Dr. Burton Clark, Oshkosh, Wis. Operated upon by Dr. C. Oviatt, Oshkosh, Wis. One severe attack, preceded by colicky pain, later nausea and local tenderness. At beginning pain not localized, but became so in six or eight hours, nausea, temperature 102°, pulse 100. Advises operation, if possible; otherwise the Ochsner treatment.

FOR DISCUSSION, SEE PAGE 156

APPENDICITIS—ITS TREATMENT

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Were it possible, under all circumstances, in the treatment of appendicitis, to follow the dictum to operate within the first twenty-four or thirty-six hours from the onset of the disease, we should not be confronted with the varied pathological conditions, and the many mooted questions of dealing with it, in attempting to successfully treat this disease. The early operation will, however, probably never become the universal practice, and we shall continue still to encounter all of the different pathological conditions that are associated with neglected cases of the disease. The reasons why the early operation will never become the universal practice in appendicitis, are chiefly the following:

1. The family physician is usually called to diagnose and treat the disease in the beginning, and not the surgeon. It is expecting too much of the family physician when we look to him to diagnose the disease and call the surgeon all within twenty-four to thirty-six hours from the onset of the attack.

2. When the diagnosis of appendicitis is made within the first twenty-four or thirty-six hours, and an operation is advised, it is necessary to gain the consent of the patient and his friends, which it is not always possible to do within the time limit for an early operation. So that while the early operation should be the practice in appendicitis when possible, it must be acknowledged that its universal application is impractical, even under favorable circumstances, and we must expect to do the late operation as a life-

saving measure, and the interval operation more often than the early.

The most usual cause of death in appendicitis is diffuse peritonitis, and the treatment of the disease largely resolves itself into the best means of preventing its occurrence, either with or without operative measures. Heretofore there has been considerable difference of opinion as to the early medical treatment of appendicitis, and the practice of purgation with salines has been the most popular and the most universally practiced. I wish to deprecate this practice, except at the very onset of the disease, or unless an operation has been decided upon, and the patient is so situated that the operation can be performed at once. Purgation, unless in the very beginning of an attack, is capable of doing a great deal of harm, because of the resulting increased peristalsis, which tends to disseminate the infection to the general peritoneum. The claims that have been made concerning the therapeutic effect of purgation in lessening the virulency of the attack and tending to unload the appendix into the bowel, are certainly not based upon sound reasoning. In quite a number of cases operated upon by the writer within the first thirty-six hours from the onset of the attack where perforation has not occurred, the great omentum and several coils of the small intestines were softly adherent to the appendix. In several of these cases the appendix was on the verge of perforation, and a necrotic area could be discerned. Had purgation been the treatment at this particular time, instead of operative interference, it is reasonable to conclude that the soft adhesions would have been torn away by the peristaltic action of the intestines, and perforation of the appendix would have occurred in some of the cases, and perhaps diffuse peritonitis would have followed.

On the other hand, had operation in these cases been delayed, from some cause, and instead of purga-

tion a treatment had been instituted which would have arrested peristalsis in the intestines, it is as reasonable to conclude that walled-in abscesses would have occurred. The total arrest of peristalsis in the intestines will tend to protect the inflamed appendix, and nature's method of limiting the inflammation will not be interfered with. Were it possible to anticipate an attack of appendicitis, thorough purgation for the single purpose of emptying the bowel would be advisable, or, at the actual onset of the attack, it would still be admissible, but the routine treatment of purgation several hours after the onset is capable of aggravating the disease. While it is the consensus of opinion that there is no medicinal treatment which can arrest the disease in the appendix, it does seem that it has not been made plain that, in cases refusing operation or until the case is turned over to the surgeon the treatment should be directed solely toward the protection of the peritoneum.

In a certain proportion of cases of appendicitis, variously stated at from 70 to 85 per cent, the pathology unaffected by treatment will not progress to the stage of ulceration and perforation or to gangrene, but after an acute active course will become subacute and chronic, and will in some cases subside, leaving the appendix crippled and subject to recurrent attacks. This fact has led the unthinking internest to disfavor operative procedures, and to rely upon remedial agents directed toward the arrest of the disease in the appendix. But the fact that it is impossible in the beginning of appendicitis to determine by any known method the cases which will safely pass through the initial attack and those which will perforate or become gangrenous, has rightly placed the disease as a distinctly surgical one. The physician, however, in the vast majority of cases, is expected to diagnose the disease, and to institute treatment until the patient and his friends agree to

have a surgeon called. This frequently causes delay, which makes it all-important that the physician be capable of instituting the proper treatment until the arrival of the surgeon. That delay on the part of the physician to make a correct diagnosis in appendicitis and institute the proper treatment, or to promptly call the surgeon or refer his case to a surgeon, is productive of too great a number of cases of diffuse peritonitis, septicemia, and pyemia as complicating diseases, which it is the province of the surgeon to treat. I believe that the many mooted questions of how best to treat the inflamed appendix until operative measures have been decided upon, have at last been quite well settled, and as the legitimate outcome of knowledge acquired from operative procedures during the different stages of the disease. Such knowledge, in connection with the proper understanding of the physiology of the peritoneum, the intestines, the mesentery, and the great omentum, has finally determined a rational treatment of the inflamed appendix, not with the hope of curing the disease in the appendix, but rather for the protection of the general peritoneum. It is necessary for the internest, in instituting treatment in appendicitis, to be thoroughly imbued with the following facts, which may be reasonably deduced from the present state of our knowledge of the subject; that his patient should be advised of the advantages of an early operation; and if this is impractical or will not be consented to, then the institution of treatment which will protect the peritoneum, the great source of danger to his patient, until operation is decided upon or finally declined.

As no one is capable of predicting the course any case of appendicitis may pursue, whether to perforation, or gangrene, or to imperfect resolution, it is imperative that the early treatment in every case should be in anticipation of the occurrence of gangrene and perforation of the appendix, and be di-

rected toward the prevention of diffuse peritonitis. We should here interpret nature's method of caring for the peritoneum in the presence of infection within its cavity, viz.: (a) by the formation of adhesions between the great omentum, intestines, and appendix; (b) by the distension of the intestines and arrest of peristalsis; and (c) by rigidity of the overlying abdominal muscles and the underlying right psoas muscle.

It is by the occurrence of the above-mentioned changes, which effectually wall-in abscesses in perforative and gangrenous appendicitis, that diffuse peritonitis is prevented. It is true that these phenomena do not occur in cases where the inflammation does not extend through the lumen of the appendix, and they are not always effectual in limiting the inflammation in perforative and gangrenous cases, but until operation is decided upon, I believe in assisting nature's method of defense in every case. The principles, then, of treatment should be the arrest of peristalsis in the small intestines and the maintaining of rest in bed. Peristalsis can be the most effectually arrested by abstinence from food and drink, but nourishment may be administered *per rectum*. Posture may add something through the principle of gravity, so that we would place the patient in the improved Fowler position, that is, elevation of the head and left side of the bed. Lavage of the stomach should be practiced where vomiting is persistent. An ice-bag placed over the region of the appendix for the first twenty-four or forty-eight hours will tend to relieve pain, but if this measure fails, morphine should be administered hypodermically.

Cases thus treated from the incipiency of the attack, where early operation is declined, will have the usual percentage of cases of perforation and gangrene of the appendix with walled-in abscesses, and also the proportional number of cases of lymphatic infec-

tion with metastatic abscesses, but the proportional number of cases of diffuse peritonitis will be very much lessened.

WHEN TO OPERATE IN APPENDICITIS

I am an advocate of the early operation in all well pronounced cases of the disease, that is, within the first thirty-six hours. The dictum to operate as soon as the diagnosis is made may be dangerous, and should always be qualified, for the diagnosis may have been made too late for an early operation. When the case is seen too late for the early operation, as evidenced by the presence of circumscribed peritonitis or beginning of diffuse peritonitis, then I would advise the abstinence from all food and drink, the instituting of rectal alimentation, the repeated administration of morphine to allay pain, and the placing of the patient in the improved Fowler position. Such a plan of treatment if rightly carried out will, in my opinion, safely carry a large number of cases through the first attack, and an interval operation can be made. A small percentage of such cases will have gangrene of the appendix, perforation, and abscess formation, which, in most instances under such a course of treatment, will become walled in, and operation may be deferred until the subsidence of acute symptoms. The fact that no one can be capable of diagnosing the extent of the disease in and surrounding the appendix from the symptoms present or from any method of physical examination that can be instituted in cases of appendicitis seen by the surgeon too late for an early operation, has led to the adoption of different methods of treatment, and it is this class of cases in which the greatest diversity of opinions as to the best method of procedure exists among surgeons.

In cases tending to abscess formation, the prevailing practice is to defer operation until the walling-in process has occurred. It has been quite well demon-

strated that the pus tends to become less virulent from day to day, and has been found sterile at operation. In perforative appendicitis, if the patient is in a hospital or can be removed to a hospital within a few hours, immediate operation should be performed. However, when operation is delayed until progressive peritonitis is evident, then I would not advise operative interference, but would adopt the treatment heretofore mentioned, believing it to be more effectual in limiting the inflammation.

OPERATIVE METHODS AND TECHNIC IN ABSCESS CASES

The question of how best to successfully remove pus from a walled-in abscess within the peritoneal cavity without contaminating the general peritoneum, is still one of the problems in abdominal surgery. The location of the abscess, whether post-cecal and extending high up behind the ascending colon or reaching low down in the pelvis or located anteriorly high or low in the abdomen, will determine to some extent the selection of a method of procedure. We are also confronted here by two distinct propositions: to perform drainage as a life-saving measure without the institution of complete work, and to drain and remove the appendix, or, if the appendix has sloughed off, to close the opening in the cecum. The first is a mere life-saving measure; the second, radical and complete work. I think I am correct in saying that the tendency is growing in favor of radical and complete work, and the more competent the surgeon the more often is he able to do successful radical work; that there is, however, a certain number of abscess cases in which the most competent surgeon would be content to do a mere drainage operation as a life-saving measure.

THE TECHNIC OF OPERATING THROUGH AN ABDOMINAL INCISION IN ABSCESS CASES

I believe that in the vast majority of abscess cases

a three or four inch incision along the outer border of the right rectus muscle is the best avenue of approach. Through such an incision the abscess can be very well surrounded with pads of moist gauze, and, whether adherent to the parietal peritoneum or not, can be evacuated with but little danger of infecting the general peritoneum. With such a technic, one can the better do complete work, that is, search out the appendix and remove it, drainage being established through a stab wound in the flank, and the abdominal incision permanently closed. I do not favor the practice of cutting down immediately over the abscess site, unless mere drainage is aimed at or the abscess fills the greater part of the right side of the abdominal cavity. Through such an incision one must trust almost altogether to his dexterity in operative manipulation, and is never quite sure that he has not broken through the wall of protective adhesions in attempting to do complete work. While it is many times possible through such an incision to pad off the abdominal cavity satisfactorily, it can be done better through the above-mentioned incision. In postcecal abscess I prefer the incision along the outer border of the right rectus muscle, unless mere drainage is practiced, when the flank incision and postperitoneal drainage may be made, or, in exceptionally favorable cases, those reaching well down into the pelvis, drainage through the rectum may be practiced.

DIFFUSE PERITONITIS

The aim of treatment in beginning diffuse peritonitis should be the arrest of the spread of the inflammation. It is here that surgeons differ very much as to the best method of procedure. Deaver, Morris, and many other prominent surgeons recommend immediate operation in this class of cases, and this is probably the most universal practice. However, Ochsner pointed out a method by which the inflammation could

be arrested, by the walling-in process, in probably 90 per cent of such cases, which would place them under the same category as abscess cases. It is the writer's opinion that the Ochsner plan of treatment is based upon the proper interpretation of nature's method of protecting the peritoneum, and that, as a general method of treatment, it is the best. It is the opinion of the writer that in many of the reported successes from operation in diffuse peritonitis originating from the appendix, in reality only the right iliac and middle abdominal regions were involved, the inflammation being circumscribed. Diffuse peritonitis, due to an infection from the appendix, is usually of the purulogangrenous variety, and is quite likely to become limited to the lower two-thirds of the abdomen.

It is evident at operation in diffuse peritonitis and at post mortems on these cases, that nature has most usually made some effort at limiting the progress of the inflammation by the formation of adhesions of the intestines and omentum. Nature should be assisted by favoring the arrest of peristalsis and by posture, operative procedures being deferred to a later period. Such cases will not all recover, but a larger percentage will, in the writer's opinion, be saved than by operative procedures during the progressive stage of the inflammation. The operative technic in these cases should be identically the same as in large abscess cases, namely, incision and the establishment of drainage.

CONCLUSIONS

1. In incipient appendicitis, until the patient is placed in the hands of the surgeon, all food and drink should be withheld, and the patient nourished *per rectum*.

2. Every patient should be advised of the advantages of an early operation.

3. Radical work, that is, the removal of the appendix or closure of an opening in the cecum, should be made in abscess cases when it can be done without additional risk to the life of the patient.

4. The practice of merely draining in every abscess case should be condemned as non-surgical.

5. Operation during a progressive diffuse peritonitis will be attended with a higher mortality than the method of procedure recommended by the writer.

6. That if the internest would direct his efforts, in the treatment of appendicitis toward the protection of the peritoneum until he could transfer his case to the surgeon, the mortality in this disease would be greatly lessened.

7. That the adoption of the more rational method of dealing with diffuse peritonitis, will convert a large percentage of these cases into circumscribed peritonitis, when they can be rightly classed as large abscess cases, having the same mortality-rate.

FOR DISCUSSION, SEE PAGE 156

IDEAS CONCERNING THE MANAGEMENT OF APPENDICITIS, BASED UPON ONE THOUSAND OPERATIONS

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It is not the purpose of the writer to enter into an exhaustive dissertation upon the subject of appendicitis. The field has been most thoroughly covered during the past few years, and so far as its etiology, pathology, symptomatology, and diagnosis are concerned the opinion of the profession may, for practical purposes, be said to be in accord. This, however, cannot as yet be said concerning the treatment of the disease, as many honest differences of opinion yet exist, many of them differences varying only in degree, but sufficiently marked to convey to numerous members of the profession the idea that the treatment of appendicitis is a subject still more or less *sub judice*.

Actuated by the belief that the various phases of the question, "How shall we manage our appendicitis patients?" may be best answered by a study of the methods employed by various men, I venture to add my testimony to the large mass of evidence already in print.

During the years 1893-1905, inclusive, I have operated upon 1,024 cases of appendicitis. Of this number 640 were clean cases, and 384 were pus cases. By clean cases I mean those in which the infection was still confined within the appendix; by pus cases, those in which the infection had escaped from the appendix and established a septic process, localized or diffuse. Of the total number, 993 patients re-

covered and 31 died, a mortality-rate of three per cent. Among the clean cases, acute or chronic, 640 in number, 639 recovered, and 1 died, a mortality-rate of one-sixth of one per cent.

Among the pus cases, 384 in number, 354 recovered, and 30 died, a mortality-rate of eight per cent.

It seems no more than fair to state in passing that more than half of these operations have been made during the past six years, and the mortality-rate secured is because that fact has permitted the application to these patients of greatly improved methods of treatment, among which may be mentioned posture and drainage.

Believing that appendicitis is a surgical disease I have always been an advocate of immediate operation, and have followed the rule of operating upon every case as soon as seen unless the patient was practically moribund, with the exception of some few cases, *presumably* of mild type, in which the patient presented well marked contraindications to any surgical procedure, and it was thought inadvisable to operate under any circumstances. This, in brief, is the plan still employed, and increasing experience only tends to further strengthen my belief in it. Every death from appendicitis must be charged to the account of procrastination or negligence, and the responsibility for its occurrence falls upon the family of the patient, his medical attendant, or the surgeon. The patient or his family may to some extent evade this responsibility by pleading ignorance. At this late day, and in the light of the vast array of evidence accessible to all, what shall be the excuse of the medical man who was called early? It is absolutely impossible for any man, however great his experience, to accurately prognosticate the course of any given case of appendicitis from its inception. It is within the power of any man to promise speedy and certain recovery to *every* case of appendicitis operated upon sufficiently early.

But it was not my intention to take up at length this line of argument although sufficient excuse for it is declared daily in the obituary columns, and the necessity for the appendicitis missionary has by no means ceased to exist.

CLASSIFICATION OF CASES

For practical purposes we may divide our appendicitis cases into two classes, clean cases and pus cases, the former including all cases, either acute or chronic, in which the infection is still confined to the appendix and the latter including cases in which a septic process, either circumscribed or diffuse, has been established with the appendix as its point of origin.

From the standpoint of results I have found no difference between an acute, clean appendicitis and those of the so-called chronic type, for in 640 operations upon cases of both varieties, made at all stages of the disease where the infection was confined to the appendix, there was but one fatality, and that was charged to the fact that I had the night before operated upon a patient suffering with a violent streptococcic infection of the face and neck, and although scrupulous pains were taken to prevent infection, the patient upon whom I made a simple interval appendectomy died in forty-eight hours of acute diffuse septic peritonitis, and streptococci in large numbers were found in the peritoneal fluid.

As to the pus cases. The results which are now being secured in cases of diffuse septic peritonitis have rendered it much less formidable, and have done much to bring more nearly together the mortality of circumscribed and spreading peritoneal infections, the result of appendicitis.

I have had more deaths from localized, appendicular abscesses operated upon during the past few years than from the series of cases of diffuse peritonitis. This of course may be partially explained by the much

greater number of cases belonging to the first type which are encountered at operation, and yet it is a striking illustration of recent surgical progress, for it is only six or seven years since practically all our patients with diffuse septic peritonitis died.

I am unable to estimate as yet the respective death-rates for cases of circumscribed and widespread peritoneal infections, but I am positive that the difference is very much less pronounced than formerly. Excluding those cases which are moribund and those in which definite contraindications to any operation exist, the treatment of acute appendicitis is preoperative and operative.

Preoperative Treatment.—As soon as the diagnosis of appendicitis is made, the head of the bed should be elevated at least twenty inches, and the patient turned sharply upon the right side. In the event of unavoidable delay in getting the patient into the hands of a man competent to make the operation, this posture will greatly assist in localizing and confining escaping infection to the region of the appendix. An ice-bag should be applied to the right lower abdomen, and all feeding immediately discontinued. An enema may be given if desired, but I am strongly opposed to the administration of a cathartic in any case of acute appendicitis prior to operation. I have seen many cases in which much harm had been done by the peristalsis thus set up, and as we can never be certain as to the exact condition within that abdomen I do not consider it safe to "give a cathartic early," as is so frequently advised.

What is early when we are considering appendicitis? I do not know unless it is the day before the disease began.

Then there is the question of morphine. No patient should, under any circumstances, be given morphine at this stage. The price he may have to pay for his indulgence is too great, and need not be longer dwelt

upon. If operation is in any particular case not to be considered morphine might be administered, but never until the diagnosis has been established. All patients, whenever possible, should be removed at once to the hospital. No operation should be made for appendicitis at the home of the patient when it is possible to place him without loss of too much time in a well regulated hospital. As a rule it is safe to state that a patient who is not too ill for operation is not too ill to be moved. The elevated position of the head and trunk and the inclination of the body to the right should be maintained during the journey.

Operative Treatment.—The operation should be performed as soon as the diagnosis has been made, and a competent man secured to do it. I do not recommend operations upon these cases by inexperienced men. The mortality-rate could not be more certainly increased in any other manner. The attempt to put a time limit upon appendicitis and to decide to operate upon this case because it is only "twenty-four hours old," and to postpone operation in that one because it "is the fourth day and a dangerous time to operate" has been over-done. I have seen several cases of appendicitis in which the first symptom noticed by the patient doubtless made its appearance at the time of perforation of the appendix, and which were in much less promising condition for operation at the end of the first twelve hours than many other cases would be upon the third, fourth, or fifth day.

The only cases in which operation should be deferred are those in which the patient is plainly dying from sepsis, and those cases of diffuse septic peritonitis so far advanced that the shock of the anesthesia and even a brief operation will serve to tip them over. These patients, and, fortunately, they are but few compared to the total number seen, should be treated after the plan advocated by Ochsner and described under preoperative treatment, following which, should

improvement occur, they may be operated upon several days later.

All cases of diffuse peritonitis which is still spreading, should be operated upon at once. The fact that the infection is not confined to the region of the appendix is not sufficient excuse for delay in these cases, as rapid removal of the offending organ, with thorough cleansing of the soiled peritoneal area followed by proper posture and free drainage, will permit a more rapid and a smoother convalescence than can be secured for those patients who have a mass of firm adhesions about the cecum necessitating the limiting of the first attempt at operative relief to incision and drainage followed by a more or less extended period of suppuration attended by the ever-present dangers of extension of the septic process and intestinal obstruction.

Cases of localized abscess should be operated upon immediately. The practice of "waiting for the adhesions to become more firmly established" is condemned. While waiting for the adhesions to become stronger the pus may break through into the general peritoneal cavity, necrosis of the pus-bathed loops of intestine is invited, and, if these accidents do not occur and the adhesions do become very dense and firm, the prospect of making the operation a radical one with removal of the appendix is diminished, and the likelihood of post-operative obstruction is increased. If the adhesions are well enough established to warrant the diagnosis of a localized abscess they are well enough established to permit that abscess to be as properly managed at the immediate operation as at one deferred for one day or one week.

Attention is again directed to the fact that early operation upon a clean case removes at once the source of the disease and prevents the many distressing and often fatal complications and sequelæ, among which may be mentioned incomplete operations, pro-

tracted convalescence, hernia, sepsis, peritonitis, pylephlebitis, abscess of the liver, and post-operative obstruction. These and many more are penalties still too frequently imposed upon the patient by some one's procrastination, and the pity of it all is that they could and *should* have been avoided in nearly every instance.

Operation.—In clean cases, either acute or chronic, the incision is made through the sheath of the right rectus muscle. The incision provides free access to the appendix, and may be easily extended at will with a minimum of trauma, and is much preferable to the so-called McBurney or muscle splitting incision.

The meso-appendix is ligated with catgut, and a circular ligature of silk is thrown about the base of the appendix flush with the cecum. A pair of hemostatic forceps is placed distal to this ligature, and the appendix is cut away between ligature and forceps. The stump is wiped perfectly dry, and its mucosa thoroughly swabbed with 95 per cent carbolic solution. The stump is then covered by drawing over it the base of the meso-appendix or a fold of the cecum, and retaining them in position with catgut sutures. The stump is never inverted into the cecum, as it does not seem to me to be advisable to invite infection of a raw surface by deliberately placing it in the foulest repository within reach despite the fact that the various methods of preliminary treatment of that stump are said to have removed its absorbing power.

I have had no trouble with subsequent infection of the silk ligature and the persistence of a sinus after operation. The wound in the abdominal wall is closed with a continuous suture of No. 2 ten-day chromicized catgut, including first the peritoneum and posterior sheath of the rectus, and then carried back through the anterior sheath of that muscle and tied. The skin is closed with horse hair.

Infected Cases.—From the standpoint of operative treatment we may consider three varieties of cases

in which the infection has escaped from the appendix with or without perforation of that organ:

1. A more or less localized peritoneal infection in which the general peritoneal cavity is not protected by limiting adhesions.

2. An infection sharply localized and circumscribed, the general cavity of the peritoneum being protected by a wall of adhesions.

3. A diffuse wide-spread infection of the entire peritoneal cavity.

The existence of the first variety may or may not be suspected prior to operation. It is frequently encountered in cases which we hope will prove clean. In such cases the incision should be extended well down towards the pubes, as the following steps of the operation, which should be rapidly performed, are much facilitated thereby.

The appendix is ligated and removed, and the stump is disinfected and buried as described above. The portion of the peritoneal cavity involved in the septic process is then rapidly, but very gently, mopped dry with gauze packs wrung out of hot sterile water, not forgetting the cul-de-sac, which in these cases will always be found to contain a large quantity of fluid, varying in character from serum to seropus. In females the cul-de-sac is then to be rapidly opened, and a large split-rubber drainage tube, one-half to one inch in diameter, is introduced into the vagina. The abdominal wound is closed with interrupted silk-worm gut sutures. The patient is placed in a bed the head of which has been elevated at least twenty-four inches from the floor. The drainage is removed in from six to ten days, depending upon the course of the case. The age of the patient need not be considered in establishing this form of drainage. I have employed it in several cases of this kind occurring in girls under five years of age.

In males a large split-rubber drainage-tube, five-eighths to one inch in diameter and carrying a strip of iodoform gauze, which must fit quite loosely, is introduced at the lower angle of the wound to the *bottom* of the rectovesical pouch. Alongside this a smaller tube, one-fourth inch in diameter, is placed likewise leading to the bottom of the cavity. These tubes are anchored to the skin with silk-worm sutures. Through the plain tube the fluid, which tends to accumulate at the bottom of the cavity, is aspirated every two hours until the quantity secured at two or three consecutive dressings is insignificant when aspiration is discontinued. The employment of this second tube in the manner just described greatly lessens the demand upon the capillary drain of tube and gauze. The patient is placed in bed in the elevated position above described.

If at the operation it is ascertained that the infection is practically confined to the peritoneum of the right lower abdomen and pelvis, the patient is turned upon his right side and kept in this position for at least twenty-four hours. In the class of cases at present under discussion, namely those of more or less limited infection of the peritoneal area surrounding the appendix and accompanied by adhesions, which were too limited to protect the general peritoneal cavity from infection, or by none at all, no drainage of any sort, other than that described above, is ever employed. There is no reason for placing a drain in the space formerly occupied by a perforated appendix which has already communicated its infection to an area greater than such a drain can relieve. The source of the infection has been removed, and the region of the cecum requires no particular and special drainage. The peritoneum from this point to the bottom of the pelvis has become involved, and if by placing the patient in the elevated posture we secure the gravitation of fluids to the lower peritoneal pouch, that is

the point to drain. Multiple drains mean multiple adhesions and greatly increase the tendency to post-operative obstruction. The introduction of strips of iodoform or plain sterile gauze for quarantine purposes may be necessary in a few cases of this type where it has been for any reason impossible to satisfactorily dispose of the stump or when the tissue in the immediate vicinity of the appendix makes one suspicious of approaching necrosis or gangrene. Gauze is a most useful agent when employed for the purpose of isolating septic areas, but most useless when called upon to act as a drain, and it should never be depended upon alone for the latter purpose. Since abolishing the use of gauze in these cases, with the above exceptions, and draining them in the manner just described I have noticed that convalescence is much more rapid and smooth, and the danger of troublesome complications has been materially lessened.

Localized Abscesses.—In those cases where the septic process is sharply circumscribed and shut off from the general peritoneal cavity by a wall of limiting adhesions the safe evacuation of the products of infection and the successful guidance of the patient to complete and permanent recovery present many and varied problems, among the most important of which are the following:

1. Shall we incise over the most prominent portion of the abscess and establish drainage without opening the general peritoneal cavity, or shall we, as recommended by Murphy, always open into the cavity to the inner side of the pus collection, coffer-dam the field of operation, and then established drainage?

2. Shall we remove the appendix or not?

3. How may we best prevent contamination of the general peritoneum?

4. What form of drainage should we employ?

5. How shall we prevent hernia?

6. Shall we in every instance make a second operation for the removal of the appendix where it was considered improper to attempt its removal at the first?

In reply to the first question I must say that I think neither procedure should invariably be followed. The plan of attack must be adapted to the particular case in question.

Roughly speaking, we may divide these cases into two classes: first, those in which the abscess is situated external to the cecum; second, those in which it is located to the inner side of the cecum.

It has been my practice in all cases belonging to the first variety to incise directly over the most prominent portion of the tumor using every precaution not to expose the peritoneal cavity. This may in nearly every case be accomplished, and the pus safely evacuated without extravasation. Sudden cessation of the outward flow of pus during such an operation should be considered as indicating the possible rupture of the abscess, at another point, into the general peritoneal cavity. Should such an accident have occurred it is imperative that it be recognized and properly dealt with immediately. I have had four or five such cases. When the abscess is situated to the inner side of the cecum, in practically every instance, I open the peritoneal cavity to the left of the tumor first. The field of operation is then completely encircled with strips of plain sterile gauze. Each strip consists of four thicknesses of gauze three inches wide with the free edges sewn fast. These strips extend from the bottom of the cavity well out upon the anterior abdominal wall, and when in place remind one of the old-fashioned well with its brick or plank sides. Through this well of gauze the pus may always be safely conducted to the surface. The best way to accomplish this is to make the opening into the abscess so small at first that the pus may be taken up by cut-gauze

sponges as rapidly as it escapes. When the pus cavity is practically empty the opening may be enlarged as necessary. The gauze strips are left in position to be removed with the drainage from the fifth to the tenth day, depending upon circumstances.

Coming now to the second question concerning the removal of the appendix I consider that no invariable rule should be established. As experience has increased the appendix has in my work been more and more frequently removed at the first operation. However, many cases are encountered each year in which it is considered inadvisable to attempt to remove it at this time. This is a question which must be decided by individual operators in any given case entirely from their own experience.

The third question has already been answered in describing the evacuation of the abscess. As to the question of drainage: all drains employed in such abscess cavities should be of soft rubber, of good size and with walls sufficiently thick to prevent the collapse of the tube and obliteration of the drain. Glass tubes are not recommended because of their rigidity, which, in some of my earlier cases, was responsible for the appearance of fecal fistulæ. Gauze of any sort is much more frequently a cork than a drain, and is never employed for this purpose. The split tube is introduced to the bottom of the cavity and brought out through the center of the well of gauze. It is removed at any time after the fifth day that the conditions of the particular case permit.

Queries five and six may be considered together. As the opening left for drainage in these cases is invariably a large one my observation has been that if the patient is permitted to go home after his wound is closed by granulation he will, in the majority of instances, develop a hernia. Acting upon this observation I tell all patients who have been thus freely drained that they must have a second operation. That the

operation could not be safely completed at the first sitting and that they cannot leave the hospital until the second operation is performed. I have never had a patient refuse to follow my wishes in this matter. At this operation which consists in reopening the wound and freshening its edges the appendix is removed if its removal was not accomplished at the first one. I would rather remove the appendix and repair the hernia upon my cases than to have them going to some one else for relief at some later day.

The removal of the appendix at some of these second operations is extremely difficult, but I consider it a wise procedure, as fully twenty-five per cent of such cases would relapse. The organ is not destroyed by the suppurative process nearly so frequently as has been claimed.

Diffuse Septic Peritonitis.—By this term is to be understood an inflammation involving, so far as we can tell, the entire peritoneum. As I have in a former paper expressed my views as to treatment of this condition I shall not impose a detailed description of it upon you at this time, but shall merely mention the procedure which is recommended:

1. Incision from umbilicus to pubes in median line.
2. Removal of appendix.
3. Thorough irrigation of the entire peritoneal cavity with hot saline solution or hot sterile water.
4. Introduction of a large split-rubber tube for drainage: in females from cul-de-sac into vagina; in males from rectovesical pouch out through lower angle of abdominal wound and carrying a wick of iodoform gauze. In the latter a second smaller tube, without the gauze wick, is placed alongside the first, through which fluid collecting at bottom of pelvis may be aspirated.
5. In females the abdominal wound is completely closed with interrupted sutures of silk-worm gut. In

males the wound is closed with the same material down to the tubes.

6. The patient is placed in bed the head of which has been elevated from twenty-four to thirty inches from the floor.

Operations made upon patients in this condition should be rapidly performed, as they will not bear much manipulation or prolonged surgical interference.

This is the only condition in which an irrigating stream should be directed into the abdominal cavity. Its use in localized abscesses or limited peritoneal infections is most vigorously condemned.

SUMMARY

The best results in appendicitis follow early operations.

In clean cases, acute or chronic, the operative mortality is practically *nil*.

The hour or day classification of appendicitis should be discarded, and a pathological classification substituted.

In spreading peritonitis immediate operation is urgently indicated.

In patients already moribund or in those to whom the added shock of operation would determine a fatal result, operation should be delayed.

The elevated posture of the head and trunk and the resulting accumulation of septic fluids in the lowest peritoneal pouch from which they are rapidly drained by large-sized tubes, have robbed appendicitis of many of its terrors.

FOR DISCUSSION, SEE PAGE 156

TREATMENT OF APPENDICITIS IN ITS VARIOUS STAGES AS IT COMES TO THE SURGEON

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So much has been written and spoken upon this subject in the last decade that one might suppose that all had been learned as to its management, but the wide diversion of opinion between the surgeon and the internest as to its treatment in general, and the different views maintained by surgeons themselves as to the management of the different stages when encountered, would indicate that many questions are yet to be settled before the happy mean is reached.

For the convenience of discussion I have divided appendicitis into six arbitrary stages with very liberal lines of demarcation, as follows:

First, Inceptive stage, first forty-eight hours;
Second, Rapidly progressing stage,—the third, fourth, and fifth days;
Third, Non-progressing or stationary stage;
Fifth, The abscess stage;
Sixth, The diffuse peritonitis stage.

Before taking up the various stages of appendicitis as conceived by the writer for his own convenience in dealing with the subject, I believe I am warranted in stating that there exists a general satisfaction on the part of surgeons in the gradual and growing realization, both on the part of the general practitioner and the laity, that appendicitis is strictly a surgical disease and demands surgical treatment at all times at properly selected periods of that time.

When first enunciated by surgeons some years ago, this surgical dictum met with rather positive resistance on the part of the internist, but with the turning on of the light by operative measures and the exemplification of the true pathology of this affection, error has yielded, as it always must, to the truth until to-day many educated and up-to-date practitioners admit that therapeutics has no place in the cure of this disease.

First.—*The inceptive stage, first forty-eight hours.*—All surgeons are convinced and many internests admit that every case of appendicitis that comes to one capable, with proper environment, within the first forty-eight hours of the disease, should have and is entitled to a curative procedure, which will secure for him restoration to health with the least risk of life. The not infrequent experience of every surgeon in encountering the most advanced disease, a perforated and gangreous appendix, even on the first or second day, argues the danger of throwing away the opportunity of certainty for one of uncertainty and great hazard to life.

If the clinician could more often see the diseased condition at the operating-table in all of its intensity in some of the mild cases, and could see in the other case of pronounced symptoms the disease limited to the appendix alone, almost a doubt as to its departure from normal, he would grow more tolerant to operative measures and less wedded to therapeusis in the inceptive stage.

The physician or the surgeon who persuades a patient in the inceptive stage to wait for the interval, assumes a responsibility wholly unwarranted, for the interval stage by no means comes to all; in some, opportunity has knocked and, unadmitted, has gone, never to return.

Certainly the physician and surgeon have a common interest in the saving of life and the study by each of the pathology at the operating-table must tend to a mutual conclusion as to the proper management of

this disease in its various pathological stages. This common study, we believe, is gradually growing toward, and will eventuate in, a universal professional belief that all cases of appendicitis should, if possible, be operated upon, if seen by the surgeon, the first thirty-six or forty-eight hours. The failure to make a diagnosis on the part of the practitioner, and the refusal of the family and patient to listen to a reasonable demand for operative measures in the inceptive stage, are responsible for almost all the factors entering into the mortality of appendicitis.

Second.—*The rapidly progressing stage,—the third, fourth, and fifth days.*—The stand taken by a few surgeons, that the appendix should be removed regardless of the stage of involvement, is not in harmony with the pathological process known to be present at certain times of the disease. This is the stage where experience and experiment have demonstrated that operative measures increase rather than lessen the mortality. It is in this stage that Ochsner enunciated a sound surgical principle, lavage and peristaltic rest by rectal feeding. The fact of its misconception and its misapplication on the part of the medical profession in general by no means disproves the correctness of his theory. The probably enforced admission that this procedure has resulted in greater harm than good by probably increasing the mortality of appendicitis in general in its first years of promulgation, by no means argues its nullification in eventually proving a life-saving procedure. The seizure of this treatment by the opponents to the surgical treatment of appendicitis in general, and its application to all cases, have proven a curse to humanity and a setback to the advancement of proper surgical treatment of this disease. That a better understanding and better education will confine its application to the class of cases intended by the author, we believe to be a certainty. That the rabid attacks upon Ochsner by some surgeons have been ac-

tuated by the commercial sting, in the misapplication of his theory by the general practitioner and an apparent lessened number of patients for surgical aid, rather than by real scientific difference with him, is plausible to a competent and unbiased observer. The admitted honesty of Ochsner, the extensiveness of his clinic for a number of years, and the verification of his experience by a large number of other surgeons should be convincing evidence of the correctness of his theory, even if the critic has not the fairness to admit or the clinical material necessary to prove it in his own work. Operation in this stage usually means rapid extension of the sepsis and death; peristaltic rest means a limitation of the lesion and a day most favorable for surgical intervention. That the duration of this rest period may be and is often extended too long, is the belief of many surgeons.

Not infrequently cases come to us from the general practitioner with the remark, "I put this case upon the Ochsner treatment, he improved for a time, and then had a relapse."

There is a time when nature totters under her burden, and a leak takes place in her fortification, and the case extends into the general peritonitis stage unless the surgeon comes to her rescue at the proper time. Experience and good judgment must decide the time limit in these cases. The extreme position taken by Ochsner in the early promulgation of his treatment of waiting three or four weeks we believe unnecessary, as nature will have done all the good in her power within the first ten days or two weeks.

Third.—*The non-progressing or subsiding stage.*—Not infrequently an appendicular disease comes to the surgeon with all the symptoms and physical evidence of a subsidence. Reason would indicate that nature in this case had mastered the situation for the time, and would lead to a period of safety if judicially assisted by rest and guarded diet. Experience has fully

convinced the conservative surgeon that it is best to keep hands off and let these cases drift into the interval period. These cases seldom show a tendency to relight into active progress, unless the quietude is disturbed by injudicious dietetic measures or ignorant therapeutic application.

Fourth.—*The interval stage.*—This is the stage for self-congratulation for him who reaches it—an unpromised but fortunate entrance upon terra firma in the march of appendicular inflammation. It is the stage of sanguine hopes, splendid promises, ideal surgery, and happy culmination by surgical operation. If the ideal management of appendicitis were possible, this stage would never be reached. If the surgeon could see all the cases in the inceptive stage there would be no interval stage, there would be no abscess stage, there would be no peritonitis stage and comparatively few deaths, but until the family physician the world over follows the lead of such men and internists as Billings, Fitz, and Biggs, who favor and teach early operations, surgeons will have to continue to battle against the desperate stages with their uncertain termination.

Fifth.—*The abscess stage.*—The potency of an abscess in the right side of the abdomen is convincing evidence to patient, friends, and family physician that surgical interference is indicated and imperative.

It has been proven within the last two years that the only way to eliminate the appendix from the abdomen is by excision, hence the explosion of the old theory, that the appendix sloughed and came away with the pus and debris from an incised and drained appendicular abscess. Recurrence after a simple incision, necessitating re-operation and the invariable presence of the original offending organ, has convinced surgeons that to cure appendicitis the appendix must be removed. Another observation worthy of

note is the attachment of the appendix in all cases at the line of original incision.

Radical operators like Deaver and his followers, acting upon the established fact that cure means removal, advocate and claim to practice separation of the adhesions and removal of the offending organ with a low rate of mortality. These statistics have, however, been received with considerable doubt. Many surgeons following the teachings of Deaver, have been compelled, by reason of a large mortality, to abandon this radical procedure, and many others have never seen their way clear to follow it, but have been content with simple drainage. Those more conservative and more conscientious, and possibly less skilled than Deaver, believe in two safe rather than one dangerous operation. We believe that in all cases of appendicular abscess patients should be told that the first is only a preparatory measure for the removal of the appendix at a period not further than five to eight weeks.

Sixth.—*The stage of diffuse peritonitis.*—Greater advancement has been made in this class of cases in the past two years than at any other stage. Prior to this time surgeons in general took a pessimistic view as to the possible benefits of operative measures, regarding these cases as beyond the pale of hope no matter what the treatment. We term these cases diffuse or general peritonitis in contradistinction to those who come to us moribund. Operation here is left to the fee-grabber or ignorant whose every work is a discredit to surgery. The simple application of the natural laws of drainage by Fowler in the forced sitting posture as a sound surgical principle gave surgeons the cue as to the rational efficacy of operative measures in this particular stage of appendicular disease. Trustworthy results of a few surgeons give convincing evidence of the hope that may be attained by more perfected technic in this desperate class. The debatable question here is not operation or non-operation, but the rudeness or

tenderness of the aid offered. Shall we simply incise and effectively drain the dependent cavities, or shall we go further and attempt to flush out the offending debris? An investigation of the advocated methods by the writer shows about an equal division of opinion on the part of operators for flushing and not flushing. In the absence at this early date of reliable statistics and confirmation of the greater merits of either method, the individual judgment and experience of each operator must decide whether it is best to foster, protect, and assist nature, or by rough fingers, tear away the fibrous exudate, and wash septic material over an unsoiled territory. A limited experience and the careful consideration of the pathological condition found in this stage leads me to believe that the least manipulation possible means the least mortality.

We believe in the diluting and neutralizing effect of a serous exudate upon the toxines of infection, and admit that further dilution by salt water may prove beneficial, but why inflict greater trauma to an already wounded peritoneum by flushing when there is an innocent and equally beneficial route of dilution by the application through healthy avenues of absorption? We all realize the circumscribing fraction of a fibrous exudate, then why tear down the protecting wall to toxine invasion?

SUMMARY

The writer believes, with a mind open to conviction and liable to complete reversal byfuture advancement—

First. That appendicitis is always a surgical disease.

Second. That every case should have and is entitled to operative measures within the first forty-eight hours.

Third. That the rapidly progressing stage is the stage of applicability of the Ochsner treatment and by it offers the lowest mortality.

Fourth. That cases coming to the surgeon with evidence of gradually subsiding symptoms, should be deferred for a more favorable operative period.

Fifth. That every interval or chronic case should be urged to the operating-table.

Sixth. That abscess cases should be given two safe rather than one hazardous operation.

Seventh.—That diffuse peritonitis should have all accumulated dependent cavities primarily and carefully incised and drained and not flushed, and, secondarily, the offending organ excised.

DISCUSSION OF THE FOUR PRECEDING PAPERS

Dr. James E. Moore, of Minneapolis, Minn.—I did not expect to be called upon to say anything upon this topic, as I had my say last June in the Journal of the American Medical Association. I have nothing new to offer since that time, but simply wish to put myself on record in regard to this subject, taking as a text the admirable papers to which we have listened.

The most interesting point to me developing from these papers is that, although there is a wide difference of opinion with regard to certain points, they demonstrate that we are getting closer and closer together with reference to appendicitis.

Dr. Perkins cited a long list of physicians who have had this disease, a large percentage of whom have been operated upon, and a large percentage of them are in favor of early operation and will recommend their patients in the future to be operated on early. We are trying to educate physicians to that point. Perhaps the average patient with appendicitis has something like four or more attacks before he comes to the conclusion that it would be wise to be operated on. We know that a large number of physicians now advocate early operation. When we get physicians to understand that the interval operation is the thing to recommend, in the interval, and also that an operation within forty-eight hours from the beginning of an acute attack is almost as certain to be successful as an operation done in the interval, then we shall have achieved success, and then we shall save many lives that are now sacrificed. I believe all surgeons are agreed that an operation in the first forty-eight hours is attended with such a small mortality that it is scarcely worth considering. Physicians are rapidly coming to that point.

I agree almost totally with Dr. Perkins, Dr. Campbell, and Dr. Wallace. Dr. Knott and I agree as regards oper-

ating on cases early, and on the interval cases; but he carries out the idea of the extremist when he advocates operation under all conditions. We have threshed this subject over and over in the American Medical Association. The extremists take this position, and their most strenuous advocate, Dr. Deaver, gave a mortality-rate of 17 per cent, and I said to Dr. Deaver at the time that if he could not show a better mortality-rate from operative interference he had better let these patients alone, because I thought nature would cure that many. His mortality-rate was reduced to 15 per cent or less later. Now, such a conservative man as Dr. Ochsner of Chicago, showed a five per cent mortality-rate. What clinched the matter at the last meeting was that the men who advocated operating on every case as soon as the diagnosis was made, no matter at what time it was made, evidently felt they were getting the worst of it, because they indulged in personalities. I advise what I am pleased to term conservatism in the spreading peritoneal cases. I am very much in the position of the old man who when he came to die, said to his son, "Honesty is the best policy. I know it, because I have tried both." I felt that I have a right to speak with reference to the advisability of operating or of letting alone those cases of spreading peritonitis, the only ones in which there is much difference of opinion, because I have tried both ways. I tried earnestly and conscientiously operating on all of them, because I thought it was my duty to do so, but my results were unsatisfactory. I do not operate on them all now, and I wish to refute the doctrine which was promulgated here yesterday that all cases of suppurative appendicitis that are not operated upon and drained, die. They do not all die. Seventy-five per cent of my cases of that kind get well when I treat them expectantly. When I see that I can do some good and no harm I will operate. When it is a question with me whether I shall save or kill a patient, I let him alone. Some of these patients die because they are operated on, and it seems to me safer and more rational to take the view that we are only human agencies; that we are only calculated to do good, and this we should do when we are reasonably positive and can demonstrate beyond controversy that this can be done. Even the most enthusiastic advocates of operation, if they will go over their cases, will tell you that a certain number of their patients are bound to die if they operate on them. They die more quickly from the effects of the operation than they would otherwise. I am

satisfied that some of the patients I operated upon some time ago would still be alive had I left them alone. My conscience is clear, however, because I acted in accordance with the light I then had, but I feel I have more light today than I had then.

Dr. Ochsner has done a great deal of good; but I would call attention to the fact that a great many physicians, as well as surgeons, have misunderstood him. Surgeons speak of his method in a rather loose way. We speak of the Ochsner method as being applicable in cases of appendicitis which, for some reason, we do not feel like operating on at first, and physicians will call us when the patient is in a bad condition, when it is dangerous to undertake an operation, stating that they have been trying the Ochsner treatment, while the Ochsner treatment is not for appendicitis at all, but for peritonitis. It is applicable in those cases that you and I and a host of other men feel are not fit to operate on. We feel that nature can do some good, and with our assistance in preventing peristalsis, we can get many of these patients in a condition where operation is safe and advisable.

In the matter of position for drainage, I cannot speak advisedly, but we have here several men who are enthusiastically advising us to turn one end of our patient up, showing us that they are much more likely to get better. On the other hand, we have a number of surgeons who are enthusiastically in favor of turning the other end of the patient up, believing they are more likely to get well. I do not know which is right, and until the balance is a little better, I shall continue to keep my patients on the level. I am open to conviction. It is true, the results of Dr. Knott and others who recommend this position have been excellent. I am pleased with the results they report. At the same time we must remember that in the majority of cases upon which we operate radically, position has not much to do in the matter. Nature takes care of that. Pus it not floating around in the peritoneal cavity. While I feel that I have no authority to speak on this phase of the subject, still I feel a word of criticism is in order, to bring out strongly the evidence with reference to position and drainage in these cases. I am not so sure that it is necessary to make an opening to let pus or serum come out at the bottom of the wound, or to put the patient in a position where you expect the pus to drain at the lower end. Pus is not floating around loose like

water in a barrel. The patient is entitled to some consideration so far as comfort is concerned. I am sure, if I were very ill I would not like to be standing on my head, but would like to lie on my back. I feel that I should want to lie on my back if I had pus in my abdomen at the present time, notwithstanding all that has been said with reference to position and drainage.

Dr. J. W. Andrews, of Mankato, Minn.—I have only a few words to say in reference to this interesting subject.

In a discussion before the Minnesota State Medical Association, following the reading of an excellent paper by Dr. Moore, I made the statement which I am going to make now, and I found I was rather up against it, so far as authority was concerned; yet I cannot help giving my convictions, because of the experience I have had. It is this: Time is made too much of an element in deciding as to when to operate upon a case of appendicitis. I think you will all agree with me that cases come under our care in hospitals that have had unquestionably well marked appendicitis for two days, with a pulse of 100, and a temperature of 101 degrees. Forty-eight hours have passed. The disease is local. There is no peritonitis. That case is safe to operate upon. Another case comes into the hospital with a history of having had appendicitis, say, for ten or a dozen hours. The patient is vomiting; the temperature is perhaps 103.5 degrees and the pulse 120 to 130. Now, gentlemen, is it safe to operate upon a twelve-hour patient with that temperature and with that pulse? I have done so in the past because of the teaching of such men as Deaver, Murphy, and others of authority. I say I have done so, and I have lost my patients. Now, I am very conservative. I believe in the Ochsner treatment, and I have been surprised at patients coming into the hospital with a temperature of 100 degrees, or 102.5 degrees, and a pulse of 120, and by putting them at rest and under the Ochsner treatment, in two or three days the temperature would go to normal or nearly so, and in a week's time it would be normal. The pulse would also be normal, and the patient would be in a good and safe condition for operation. I have had patients in whom pus had already formed in considerable quantity, and when placed upon the Ochsner treatment for a week or ten days, the pus would practically disappear, the patient would have a normal temperature and normal pulse,

and would otherwise feel well. How much pus is absorbed under those circumstances? I asked Dr. Ochsner that question, and he said possibly a quart would be absorbed. That may be so, but I am satisfied that some, or a considerable amount, is absorbed. In patients who had leucocytosis, the blood count would show the presence of pus. In patients who had pain and other symptoms over the peritoneal region, with the presence of pus, after a week or ten days under the Ochsner treatment the pus would disappear, and the patient would be in a condition sufficiently safe to operate upon.

Dr. Knott objected strenuously to the use of morphia. If we are going to check or stop peristaltic action by withholding all food from the stomach, what will assist us better than a dose of morphia given hypodermically? It will stop peristalsis, and will allay pain and put the patient at rest. I do not see any objection to giving a reasonable amount of morphia.

Dr. T. E. Potter, of St. Joseph, Missouri.—There are a few points in connection with this subject that have not been made very clear. We know that in small appendicular abscesses where the pus is of a simple variety, say, from the pyogenes lanceolatus, it may be absorbed and do but little, if any, harm. If the abscess is large absorption of the pus is of great injury to the patient. If it is virulent the toxines associated with this pus are very poisonous and will cause inflammation, not only of the peritoneum, but of proximal tissues. Who can tell whether the pus is simple or virulent? Therefore, to procrastinate is very dangerous. We will ask the question: Who of us before an operation can make the classification Dr. Wallace made in his paper? It would be difficult in many instances to make such a classification as he has made, if the operator had the privilege of opening the abdomen simply for that purpose, and even then such a classification would not be an easy matter. The surgeon is able in most instances to tell whether there is pus or whether a diffused peritonitis is setting in, but this cannot always be positively settled.

I have known men to be about their business one day and the next morning taken for the first time with symptoms of appendicitis. Previous to this there were no indications of the disease whatever. They were taken to a hospital, operated upon in the evening, before twelve hours had passed from the appearance of the first symptoms, as

far as any one knows, and loops of intestines were adherred together, the omentum was walled around the abscess and appendix, and sometimes the appendix was gangrenous, showing, without doubt, that the trouble had existed for some days without manifesting itself.

I am certain that many good surgeons open the abdomen expecting to find simple appendicitis, and, instead, they find perforation or gangrene. I have had this experience. I know of many others who have had the same; in fact, I do not believe there are many surgeons who have not. It is true in some well defined cases we may classify and be safe in waiting for the walling off period, but this is done with great risk. I have tried it to my sorrow.

Dr. H. D. Niles, of Salt Lake City, Utah.—When a child is drowning in a pool the depth of which we have no means of estimating, there is but one rule of action, and that is to throw out a rope, or by other mechanical means get the child out of the water. Some one may say the child it too weak to be moved, others may advise prayer, some may be induced to spend time in argument; but it seems to me we should keep our eyes unwaveringly fixed upon the one object of saving that life, and promptly employ the most reliable mechanical means available. That pool may be shallow or deep, we have no means of knowing; the child may be in great danger, or little, we cannot tell. So in appendicitis it is very much the same; a human life is in danger, how much or how little we may not be able to determine, we only know the patient will not be safe until the disease is removed. We are told to use judgment *when* and *when not* to operate in the presence of a dangerous infection from the peritoneal cavity. But we are not told *how* to use that judgment. For example, almost every one who maintains we should use judgment, speaks of hours to operate, and hours not to operate, but I think the candid man will admit that the item of hours, whether it be one hour, six hours, or six days, is an uncertain trifle in the working of this disease. The second stage may be attained in six hours, or it may not be reached for six days. As a matter of fact, we have three stages, or three principal pathological conditions: First, when the infection is confined to the appendix; second, when the infection is localized around

the appendix; and, third, when the general peritoneal cavity is invaded.

All admit that in the first stages they would operate, as all patients operated upon at this time may be saved. Some say we should point out to the patient the advantage of operation at this stage. I do not think that is putting it strong enough. Use every means in your power to have the patient choose this time for operation. A life may hinge upon your being eloquent at this moment. Do not think you have discharged your duty when you have indifferently explained the advantages of operating before infection has extended beyond the appendix. It is very much like telling the drowning child what to do, while you do not throw a rope.

There are honest men who believe that it is better, at times, to wait when the general peritoneal cavity is invaded. I have taken some pains in the last year to ask those men, after the general peritoneal cavity was invaded by the contents of the intestine, which might escape through a perforated ulcer or a rupture, whether they would leave such cases alone and wait? There is only one rule—wash it out. Why they should wash out the contents of the intestinal canal and leave pus in the abdomen, is something I cannot understand. If the rule is good in one instance, it is good in the other. If the rule is good to remove a mild infection, the rule is stronger to remove a more dangerous one. I believe there should be no difference of opinion about removing the appendix as soon as rupture occurs, and as promptly as we would remove the contents of the stomach or any other foreign body from the peritoneal cavity.

They speak of the trauma of severing a few little muscle fibres, fascia, and skin in a patient who is weak. In a patient, no matter how weak, with dull sensibilities, that trauma is trifling. It is true, some patients die from shock; but the mortality from this is trifling as compared with other causes. They do not die from that little injury or trauma. The first and the last stages, I think, are easy for us to agree upon. At any rate, I think they will be very soon.

We come now to the middle stage. The middle stage is the hardest one of all to determine. If there is any way I can be instructed so that I will know when the patient is out of the first stage and not into the third, and

tell the exact stage of that second stage, then I am ready to take up that question. I do not feel that we are competent to determine that. I want to say this, perhaps I am going to state it more positively than I should, but I am not going to state it any more positively than I feel; I am quite aware that those who differ from me are just as sincere, but I try to give my reasons for believing as I do. I can see no good reason for hesitating in the first and last stage, unless, of course, the patient is moribund. As to the second stage, there may be some question as to the exact time to operate. But that question is so difficult to decide that the average man cannot tell, and the average man, if he wavers from the rule of promptly operating, will lose more patients, I believe, than if he clung to the rule. So much for appendicitis.

There was one other question spoken of, and that was flushing. I agree with Dr. Knott. It seems to me very reasonable to believe that the peritoneum will perform its function better if all foreign material is removed. If all foreign material cannot be removed, it is well to remove as much as we can. If this material is removed the peritoneum will soon resume its normal phagocytic and reparative powers. Therefore, that is one reason why we should flush when we are in doubt. If we have the contents of the intestinal canal loose in the abdomen, I doubt whether any surgeon would simply open the abdomen and, seeing it, would stitch up the ulcer and leave the contents there. It does not look reasonable that the difference in degree of infection between that and other foreign material which is more virulent should lead us to leave the one and take out the other. Does any man hesitate whenever he sees undigested food lying loose in the abdominal cavity to remove it?

These papers have covered a wide field, and I have, perhaps, myself, tried to cover too wide a field in regard to details in connection with this subbject. Our aim should be to get certain principles fixed in our minds, and then act in accordance with our judgment.

Dr. Herman E. Pearse, of Kansas City, Mo.—I wish to refer to one or two points in connection with the papers of Dr. Campbell and Dr. Wallace, who raised a point in regard to the question of leaving the case during the period of abscess formation. And the second point was with reference to operating for drainage only in the pus

cases, or opening the abdomen and leaving the remains behind for a subsequent operation as future developments might demand.

I have brought here these specimens which I wish to leave on the Secretary's desk, with a dogmatic and radical statement on my part, and refer to the specimens for proof. When a patient with appendicitis is seen, he or she should be operated on in all instances. If there is any contra-indication to the operation, or anything to interfere with that rule, it is some physical condition on the part of the patient, and nothing in regard to the disease that we are to attack; and I will submit the specimens here for proof. In the second place, when these cases of abscess formation are opened, we should remove the appendix, clean the field, and then treat the peritoneum properly we are leaving behind. That was not my belief a few years ago. This has been hammered into me by the burrowing of pus, by the necessity for a second operation as a serious handicap, and by the loss of patients. After opening the abdomen and draining an apparently innocuous appendicular abscess, the patient is too frequently told by the family physician that now the pus is removed there will be no trouble, and that the patient will go on and get well. The specimens I have here with the pathological condition behind them will speak for me. In one there is a fecal stone which lies like a bullet in a perforated appendix, and the surgeon who waits one or two or three days for a safer time to operate is leaving a leaking hole there, and might just as well be waiting after perforation from a gunshot wound. The second specimen shows a perforation with a gangrenous mass, with a fecal stone showing plainly and with disease up and down it, and the doctor who lances an abscess and leaves that kind of thing in the bottom of it, or the doctor who waits for that kind of mass in the peritoneum to be walled in, might just as well, in view of this perforation and the pus cavity behind it, wait for the same condition to take place in a gunshot wound of the abdomen.

Dr. Lewis Schooler, of Des Moines, Iowa.—I presume there can be very little difference of opinion in regard to early operation for appendicitis; but I think the term thirty-six and forty-eight hours is a very unfortunate one. I think that an early operation and a late operation depend upon the condition of the patient as well

as upon the condition present, and I am satisfied that the term forty-eight hours or twenty-fours has done a great deal of harm to the younger men by leaving an impression that a time limit can be put upon these cases. I presume that experience of the members has been the same as my own in this regard; that all of us have seen cases very early in which we did not want to operate, and we have seen other cases in which we wanted to delay operation.

There is another extreme. Some one mentioned eight days. I think that is equally as faulty as the term forty-eight hours. Certainly, all of us have seen cases that we did not operate upon for thirty days after the attack. It depends largely upon the extent of the disease within the abdominal cavity and upon the condition of the patient.

One other point I wish to speak of is with reference to prolonged anesthesia in these cases. I think it is wrong for anyone to attempt an operation who is not reasonably expert in finding the seat of the difficulty and in doing the operation as quickly as possible. There are lots of patients who do not die from the operation because it was untimely; they do not die because the peritoneum was unduly contaminated, etc., but a patient with a bad attack of appendicitis, kept under the influence of an anesthetic for an hour and a half to three hours, is badly treated. It is not modern surgery.

Dr. Charles A. Powers, of Denver, Colo.—I am entirely in accord with what Dr. Knott has said. I have confidence in his statistics. The Fowler position, with the best drainage that can be established, is the best treatment for peritonitis which we have today. The surgery of tomorrow may be better than that of today, just as that of today is far better than that of yesterday. My friend, Dr. Perkins, who says he has obtained good results from the use of antistreptococcic serum in these cases, has been more fortunate than I have been. I have seen no results from it whatever.

Dr. A. H. Cordier, of Kansas City, Mo.—There have been one or two points brought out in this discussion which I do not feel like letting go by without making a mild protest. We all recognize the fact that when patients with appendicitis are operated upon in the interval of the attacks they practically all recover. I do not think any

of us are likely to lose one of these patients who is operated on in the interval of the attack. The patient in the interval of one or more attacks is in an ideal condition to be operated on. But while we are waiting for patients to get into the interval stage, it is sure that a certain percentage of them die. If we wish to approach our ideal in operative procedures in appendicitis, we must have the patient in as near a normal condition as possible. If we get these cases early and operate on them early, nearly every one of them will get well. If we operate on them within a few hours after the onset of the attack nearly every one of them will recover. If we wait for given symptoms to manifest themselves (and no two cases are exactly alike), we are liable to lose the golden opportunity to save the patients by this delay.

What is the result of the so-called Ochsner treatment? It has been this: It has swung the pendulum back in the wrong direction in appendiceal pathology. I have studied the subject carefully, as Dr. Ochsner has put it forth, and I object to it in the main. The man who read the article a number of years ago, or heard something of the treatment, knows practically nothing about it. An interpretation of Dr. Ochsner's views by many has led to considerable trouble. Instead of getting these cases of appendicitis today in the first and second days of the attack, we are getting them a week afterwards, and, as the papers have indicated, instead of having these operations done early, so that the patients may make a smooth convalescence, we have cases recorded in which large abscesses have burrowed into the rectum. We have had drainage tubes underneath the liver. In other words, as Morris has said, we have practiced taxidermy in the right iliac fossa, packing in gauze, with an uncomfortable convalescence, with perforations, fecal fistula, and results which are the late manifestations of appendiceal disease. As long as we countenance delays in these cases, just so long shall we have cases with such marked disease to deal with. A few years ago we got these cases early, and they had a nice, smooth convalescence. It is extremely rare nowadays to get a case of appendicitis to operate on who has not had the Ochsner treatment, and delay, and the resulting complications as the result of the delay in operating.

One of the speakers said that many of the cases operated on have died. I am satisfied from his description of the cases that they died following the operation,

but did not die as a result of the operation. They died in spite of it. We have in some cases a type of peritoneal invasion which we seem to lose sight of, particularly with regard to its severity. A given number of cases of appendicitis die after operation. If you operate, for instance, on one thousand cases, of that number it would be mighty rare if you did not strike a few cases that would die in spite of everything that can be done for them, and that is the variety in which there is, at the time perforation takes place, an infection due to the streptococcus, in which the appendix has become ballooned, so to speak, and as a result of cicatricial strictures at the base of the appendix, the appendix is filled with pus and with streptococcic infection. A small pinhole perforation takes place and the infected material is squirted into the peritoneal cavity, the infection being distributed over such a large area that nothing will save the patient. It does not matter whether you operate or not, many of these patients will die.

Perhaps we cannot do better than to compare these cases to a peritoneal erysipelas, a condition in which, regardless of what you do, whether you make an incision, or wash the cavity out, the infection spreads so rapidly the patients are going to die. I have never seen such a case recover. It does not matter whether you operate on cases of diffuse septic peritonitis from appendicitis or not; they are likely to die. I have seen cases recover seemingly who had a general peritonitis at the time of the operation for appendicitis, but I have always doubted the diagnosis afterwards. We are not able to draw a distinction between peritoneal hyperemia and a true general peritonitis. We all know that as soon as we have an irritation in the appendix of an inflammatory character the muscles of the abdomen instantly become rigid, and the nearer that approaches the peritoneal surface of the appendix the greater will be the rigidity, and the more extensive the disease will become. As the disease progresses you get a little larger territory involved surrounding the appendix. Then, instead of unilateral rigidity, you will have bilateral rigidity, not as a result of the true peritonitis, but as a result of the peritoneal hyperemia that takes place, the same as you have surrounding vaccination spots on the arm, the hyperemia probably extending to the fingers, with tenderness, rigidity, etc. This frequently misleads us in thinking we have a true

peritonitis when it is a localized condition. We all know that this condition is brought about in these cases by delay. If we operate on them early, we shall ward off the untoward attacks and save nearly every one of them.

The Ochsner treatment has given appendiceal pathology the worst black eye it has received in many a day. We fought the battle for a number of years, and seemingly up to the time Dr. Ochsner came forward with his treatment had won; that is, we had reached the proper treatment of these cases. But when Ochsner's article came out the pendulum swung too far. I do not think there can be any question with regard to the advocacy of this treatment and its application in unsuitable cases, but that many lives have been sacrificed.

With regard to the time to operate, operate on them at any time you see them, provided the patients and friends are willing. Do not shrink from these operations because you are doing yourselves injustice; you are doing your patients injustice, in my opinion, by not operating on them and taking chances. If the face of the patient is blue; if the pulse is 180, and there is regurgitant vomiting, with distended abdomen, and the patient is bound to die, of course it would be foolish to operate. I think in all the fifteen years since I have been doing appendiceal operations, I have had no occasion to change my views in regard to the pathology and proper management of this disease. When these patients come to me I operate the first hour, the second hour, the fourth or tenth day. It matters not when they come to me, I operate on them, and with very few exceptions they have recovered.

Dr. W. W. Grant, of Denver, Colo.—There can be no ironclad rule as to the time to operate. Many patients can be operated on safely at the end of three days, and others cannot. I still maintain the position that if all cases could be operated upon within twenty-four hours, the mortality would be so exceedingly small that we would hardly hear anything about the disease. When we remember that from twenty to twenty-five per cent of the cases not operated on recur, we have a strong argument for removing the appendix early in the acute attack. and, if not then, in the first interval.

As to the most appropriate time for operating, in the interval or in the chronic cases, that must be left largely to the judgment of the surgeon. It may be done within

a week or two or three weeks with perfect safety. I feel confident that there is some danger in a case of circumscribed abscess—a danger that we would not otherwise meet, by breaking up adhesions in the endeavor to remove a gangrenous appendix, or the stump of a gangrenous appendix, because of the danger of rupturing into the peritoneal cavity, infecting that cavity, and causing septic peritonitis. Dr. Deaver told me that he thought any case should be operated on if seen within seventy hours, and he removes the appendix in all cases, no matter what the condition of the patient or parts. He takes this risk. I have great respect for him, yet it would be dangerous practice for the average surgeon to remove the appendix in some of these cases at this time; and it would cause many patients to die who would otherwise recover. There is nothing plainer to me than that in most of these pus cases we should simply open and drain, if there is no infection of the peritoneal cavity. I believe in draining thoroughly and in irrigating with tubes. Gauze will not drain after twenty-four hours. Of that I am convinced from a considerable experience, because gauze soon becomes clogged, and it so adheres to the peritoneal surface that it is painful to the patient to remove it. I therefore think that the time limit, as I have previously stated, depends largely, in these cases of circumscribed abscess of the appendix, as well as the question of removing the appendix, upon the discriminating judgment of the surgeon, which is appropriate in this disease, as in every other surgical condition.

Dr. Perkins (closing the discussion on his part).—Dr. Moore objects to the rule of operating on all interval cases. I believe that if we should operate on all interval cases we would soon cease to have so many acute cases. The question arises, is appendicitis a surgical or is it a medical disease? I think we are all agreed that appendicitis is a surgical condition from the beginning, and that we should handle these cases at the time and in the manner to get the best possible results in all cases. Take one hundred cases and treat them entirely medically. Then take one hundred cases and treat them surgically from the beginning. How many will you lose out of the one hundred cases treated medically, and how many will you lose out of the one hundred cases treated surgically? We know that our acute cases come very largely from the interval list. The statistics I read yesterday show that one hun-

dred men had four hundred and fifty attacks, an average of four and a half attacks each. If these cases had all been operated on in the interval after the first attack they would have been spared the danger of three hundred and fifty attacks. We can all call to mind cases where the appendix ruptured before or during the second attack. We shall get the second attack in almost all cases. There is no question about it.

I would *never recommend* the Ochsner or any other medical treatment if good surgery is available. That point I tried to emphasize in my paper, but where good surgery cannot be had I know of no treatment so good as Ochsner's.

I believe also that we cannot as a rule get a correct idea of a case if we try to base our opinion on the time that has elapsed since the onset of the attack. We must look at the conditions present in each case.

DR. CAMPBELL (closing the discussion on his part).—It would seem, in listening to this discussion, that there is considerable diversity of opinion regarding the surgical indications in appendicitis, which, I think, is largely due to the fact that we have attempted the discussion of the entire subject in a very short period of time. The subject is one that we should all be familiar with, and the only difference of opinion seems to be in the methods of protecting the general peritoneum. We know that in a large percentage of cases of acute appendicitis gangrene, perforation, and diffuse peritonitis do not occur, hence the claims of some physicians that appendicitis belongs to the domain of medicine rather than to that of surgery. We do know that physicians are not a unit on early operation for appendicitis, for if they were we should have fewer cases of abscess, septicemia, and diffuse peritonitis.

When a statement is made that the Ochsner plan of treatment delays early operation, I think it will apply only to physicians who are in total ignorance of what is intended by such a plan of treatment. I am yet to be convinced that the Ochsner method of treatment should not be applied to every case of acute appendicitis, until operation is decided upon, as I believe that by its adoption the peritoneum is best protected.

I do not believe with Dr. Niles in urging any patient to undergo operation. If you point out the advantages to accrue from operation you have done your duty. If the

operation is declined, and it is absolutely impossible to operate on such a patient, I would advise a continuance of the Ochsner treatment, when, if pus should become walled in, the operation for its evacuation will usually be consented to.

I cannot appreciate the position of any surgeon who is so very pronounced in his practice of operating in appendicitis whenever the case is brought to him, in face of the evidence that is before us today. I believe that most surgeons hesitate to operate in a spreading diffuse peritonitis on account of the frightful mortality following, and as well in some other conditions that often present themselves in cases brought to us for operation.

I believe the preponderance of evidence is against operating during an attack of a spreading diffuse peritonitis, for the reason that we are likely to spread the infection. We must also not lose sight of the fact that we have to deal with septicemia, as well as with spreading diffuse peritonitis, and, as has been fully demonstrated, such patients do not stand operative measures well.

In regard to the pathologic specimens of diseased appendices, exhibited by Dr. Herman Pearse, I would say that if he had brought along all of the pathological conditions associated with each specimen it would have required a larger set of bottles to have contained it. Had he done this then it would not have been necessary, as he stated, for him to have made a discussion of the subject, because then we should have understood him from his specimens. We know that the conditions associated with each individual specimen exhibited by Dr. Pearse must have involved the cecum, omentum, small intestines, and a portion of the peritoneum; and the surgical procedure need not necessarily be to operate as soon as such cases are discovered.

Dr. Knott (closing the discussion on his part).—It is impossible for one to close the discussion intelligently in the brief time allotted. It would seem from the remarks made by Dr. Moore that he does not believe in posture in the treatment of these cases. He has also stated that he does not believe in operating on cases of appendicitis, except in the first few hours, and he would not operate on a case of diffuse peritonitis. If I did not believe in posture, I would not operate on that class of cases. If I did not put them in the Fowler position and treat them by the most approved methods of drainage, I would discontinue operating, because none of us want to operate on patients

who are going to die. At least, we do not want to make it a habit. (Laughter.)

In localized abscesses usually we remove the appendix. The statement has been made that the appendix should be removed in every case of localized abscess. I remove the appendix more frequently to-day than I used to do, but I am not prepared to remove it in every case, for I think my mortality-rate would be considerably increased thereby. I tried to bring out the point of difference between the mortality from diffuse peritonitis and localized peritonitis, which has decreased in the last few years.

Cases of spreading peritonitis under less approved methods of drainage in the past nearly all died. Now the vast majority of them get well.

As to the use of antistreptococcic serum; it is a fetich; it is being worshipped and bowed down to and employed in case after case, and I think it has absolutely no effect upon the result, and should be discarded, and the profession at large should disabuse their minds of the idea that they can accomplish anything by giving patients this serum.

I do not believe in operating on every case. I did not make such a statement. If a patient is brought in who is profoundly septic, in an extreme condition of collapse, not able to stand the anesthetic, or if the operation would kill him, I certainly would not operate. If he gets into condition I would not hesitate to operate later. I would not operate on a man with a pulse of 150, with leaky skin, and blue face. Nobody else would. All such patients would die. No one would operate on that class.

Peritoneal infections are the same as infectious processes anywhere else, and should be dealt with accordingly. We should provide immediate exit for the products of infection, and all admit that we should limit as sharply as possible the infection to the area first involved.

Dr. Cordier said he has never seen a case of diffuse septic peritonitis recover, but has seen many of them die. In the cases that recovered he thought the peritonitis was not diffuse and general, but in those that died he thought the peritonitis was general. I would like to ask him how he was able to tell that infection was general in those cases that died, and was not general in those that did not die?

Dr. C. H. WALLACE (closing the discussion).—I thought in the beginning of my paper I offered sufficient apology

for the classification I made, and I said it was one for purposes of discussion and was by no means intended as an arbitrary one for appendicitis. Dr. Potter alluded to this in his discussion.

I believe any man who attempts to practice surgery by rule is a failure, and I should not want any one to understand me as advocating the practice of surgery by a fixed method.

I was pleased with the disposition Dr. Campbell made of the specimens that Dr. Pearse introduced in the discussion. I believe that we would all remove the appendix in abscess cases if we thought it could be done with safety to the patient. I am one of those who believe in two safe rather than one hazardous operation in appendicular abscess. If a surgeon opens an abscess and sees an appendix sticking up in the field, that can be removed without breaking down nature's barrier, I think it should be removed.

This I call good and safe surgery, and I would not want to be understood as advocating leaving such an appendix to be taken care of by subsequent operation. These conditions must be met as they are seen, and I am not one who believes in leaving an appendix in an abscess case when it can be removed conveniently and safely.

I would like to say a word in regard to Dr. Moore's remarks in the discussion. Dr. Moore was quoted by Dr. Perkins, of Denver, as saying that the interval case should not be operated upon. Dr. Moore, as I understood him, did not say this, but advocated that all cases of interval should be operated upon, but that in certain other stages of appendicitis operative procedure should be deferred for a safe period and not done when first seen, as advocated by the same surgeon.

EXTRA-UTERINE PREGNANCY, WITH REPORT OF CASE

By J. W. Andrews, M. D.

MANKATO, MINNESOTA

On January 14, 1905, Mrs. S., living in a neighboring village, was brought to St. Joseph's Hospital, Mankato, and placed under the writer's care.

Personal History.—Age 26, married four years, mother of one child three years old.

Menstruation had always been regular from girlhood, but rather profuse lasting usually one week. Patient's health had always been good, except she had suffered for several years past with chronic constipation.

Family History.—Unimportant. She had a normal menstruation the first part of November, 1904; and in the first part of December, the time for her regular menstruation, she had had a slight show lasting one-half day. She was nauseated at times, but at no time did she vomit. This condition of nausea began the latter part of November.

One week before coming under the writer's care she was seen by her home physician. She then complained of intermittent pelvic pains; her temperature was subnormal, and her pulse 120. There was practically no change from these symptoms during the subsequent week until the patient was subjected to the exertions incident to bringing her to the hospital, a distance of about fifty miles. When she arrived at the hospital her temperature was 101° F., and pulse 130. She appeared anemic and exhausted. Physical examination revealed a tenderness both at the right and

left of the uterus, but more marked on the right side, where, lying close to the uterus, was a small rather soft tumor. By careful palpation I could differentiate it from the uterus. Although in this case there had been no sharp, sudden onset of pain with syncope, as often happens, there were, on the other hand, rather light intermittent pains, yet I did not hesitate to make a diagnosis of extra-uterine pregnancy. Her attending physician had made the same before bringing her to the hospital.

Whether I did right or wrong I will leave it for you to judge, but so extreme was the condition of the patient that I did not operate for thirty-six hours. In the meantime I had her given one-half liter of normal salt solution per rectum every four hours, and one-thirtieth gr. of sulphate of strychnia hypodermically every four hours. For nourishment she was given malted milk. The pulse improved having dropped in thirty-six hours from 130 to 120, with a corresponding increase in volume, but the temperature was unchanged registering still 101° F.

Operation.—Having been made ready in the usual way, the patient was placed upon the table, and a central abdominal incision was made, sufficiently long to afford easy access to the pelvis. Upon reaching the subperitoneal fat I observed that it was of a dark-greenish color, which spoke in almost positive terms of hemorrhage deeper down. Upon opening the peritoneal cavity, blood, apparently fresh, welled up through the wound, rising an inch or more above the surface. Anticipating this I had kept my incision sufficiently large through all the tissues so that I was not handicapped in my work because of lack of room. Immediately upon entering the abdominal cavity I thrust my hand down through the pool of blood, grasped the fundus uteri, and quickly followed out towards the broad ligament, grasped the blood vessels on the uterine side with heavy pressure forceps, and

as quickly grasped the vessels on the distal side of the tumor in the same way. This stopped the hemorrhage, and I was enabled to remove about one and one-half liters of blood and blood clots with reasonable deliberation. The mass was then isolated, ligated, and removed in the usual way. I then mopped out the peritoneal cavity with warm sponge pads, but did not irrigate. Numerous small clots of blood were left here and there adhering to the intestines and peritoneum. I established drainage out through the lower angle of the wound and also through Douglas' cul-de-sac. The patient made a good recovery, and is at this time enjoying the best of health. In this operation I was very ably assisted by my partner, Dr. J. S. Holbrook.

A most careful macroscopical examination was made of the debris and contents of the sack, but no fetus or any remains of one could be found. The contents of the sack, however, were subjected to a careful microscopical examination with the following result: A small embryo of between five and six weeks' growth, the budding limbs and cartilaginous auditory canal, and also chorionic villi were present.

I have operated for extra-uterine pregnancy nine times. All have gotten well, and all have furnished a good history of extra-uterine pregnancy. In none have I been able to find a fetus, or any remains of one, except by microscopical examination. When I read the literature on ectopic pregnancy, and see the numerous cuts of well formed fetuses of variable size, I wonder if I have always been correct in my diagnosis. And yet I remember one of my cases where the family physician was present at the time of the operation, and made the assertion afterward that the diagnosis was wrong because no fetus was found. Yet in that very patient a few days after operation, milk appeared in the breasts in considerable quantity. In this

case it was presumed that the woman was five months pregnant. There was a mass of old clotted blood in and about the right tube, but no fetus. A microscopic examination was not made in this case.

History.—When we review the history of ectopic pregnancy we are surprised to find that a practical knowledge of it is a child of the latter part of the 19th century. There is a record of some early operations for extra-uterine pregnancy as early as the 16th century; but if one studies these closely he will find that they were accidents with no plan or purpose, or perhaps they were the opening of an abscess through the vagina which had resulted from a ruptured extra-uterine pregnancy.

In 1594 Primrose performed a laparotomy for extra-uterine fetation. I think this was the first deliberately performed operation for this malady of which we have any record. John Bard, of New York, was the first American surgeon to operate. I do not know the date of his operation, but it was toward the latter part of the 18th century, neither do I know whether Bard's operation was successful or not. It is a fact worthy of record that Bard's operation was followed by several operations in this country performed by country surgeons, and these were in the main successful as were the operations performed later by Sims and McDowell. While these latter operations were of a different kind, yet they have done much to immortalize the country surgery of America. Up to and including the year 1875, Dr. Parry had collected a list of 62 operations, for extra-uterine pregnancy, with 30 recoveries and 32 deaths.

Up to this time the operations had a few earnest and conscientious advocates, and many bitter opponents. It remained for the immortal Tait to popularize the operation both in Europe and this country. On October 26, 1897, Tait had operated 35 times with two deaths.

Let it not be forgotten, however, that laparotomy for ruptured ectopic gestation is one of the major operations in abdominal surgery, and the tyro in surgery should let it alone.

Causes.—The causes can be summed up in very few words if one deals with facts and not with theories. The facts are that extra-uterine pregnancy is caused by some obstruction in the tube to the inward migration of the vitalized ovum. It may be wholly mechanical by pressure from without; it may be an old salpingitis; there may be a polypus in the tube (rare, however,); or it may be a kinking of the tube. But all these mean the same thing from a practical standpoint, and few of these specific causes can be demonstrated post-operatively. There are several well authenticated cases where the impregnated ovum has migrated from one side to the other and lodged in the opposite tube, and thus ectopic gestation takes place. There is one condition which, without doubt, stands in a causative relation to extra-uterine pregnancy, and that is a long period of sterility, which so often precedes this kind of pregnancy.

Experiments on the lower animals have taught us that the spermatozoon meets the ovum at or near the ovary. Indeed, the spermatozoon has frequently been found bathing in the peritoneal fluid enveloping the ovary, waiting for his better half to come forth.

SYMPTOMS AND DIAGNOSIS

The symptoms of extra-uterine pregnancy are substantially the same as those of intra-uterine up to the time of rupture. Symptoms of this form of pregnancy should be considered separately before and after rupture. Before rupture there is no characteristic symptom—nothing to lead either patient or physician to any more than barely suspect that the pregnancy is outside of the uterus. Even a physical examination will not clear up the diagnosis, for we cannot differ-

entiate a pus tube from an extra-uterine pregnancy. The fact is, the physician is very seldom consulted in a case of pregnancy of this kind before rupture takes place. Sometimes a slight hemorrhage will appear two or three months after conception has taken place, and with this hemorrhage the decidua vera will be thrown off, and a microscopical examination will give us positive evidence of extra-uterine pregnancy, but this is very unreliable, after all, for it seldom takes place before rupture, and after rupture has taken place the physician does not need the decidua to make a diagnosis, provided intra-uterine pregnancy with abortion can be excluded.

It would seem that any practitioner would be able to exclude intra-uterine pregnancy with abortion where extra-uterine pregnancy really exists, and yet it has often happened that the mistake has been made, and the case stands on the record as abortion until future developments have proven its fallacy.

When rupture has taken place the symptoms are characteristic, and the diagnosis easy, but unfortunately it is too often too late, for frequently in the very early weeks of extra-uterine pregnancy rupture takes place, and the hemorrhage is fatal before surgical assistance can be had.

As a rule the first symptom of rupture is intense, and is accompanied by agonizing pain, which is referred to some part of the pelvis. It comes like a flash of lightning from a clear sky, and a patient will sometimes drop as if shot with a revolver.

While writing this paper Mrs. B., an acquaintance, not a patient of mine, fainted in the ball-room while she was dancing. She could not be revived by the ordinary methods, and a physician was summoned who found her in a collapse from which she never rallied. After the physician obtained a history of the case his diagnosis was extra-uterine pregnancy with rupture

of the sack and consequent fatal hemorrhage. He was probably correct.

One of my patients, the wife of a traveling man, was out riding one evening with her husband. She did not even suspect that she was pregnant, but, quick as thought, she uttered a frightful scream, and fell helpless over against her husband. So great was the prostration which immediately followed that her husband feared he would not reach home with her alive. I operated as soon as I could get her to the hospital and get her ready. A small ruptured sack was found in the isthmus of the right oviduct. The opening was small, and there was a surprisingly small amount of hemorrhage, considering the severity of the initial pain and the prostration which followed. The patient made a good convalescence.

Does it not seem a little strange, when we contemplate the character and severity of the symptoms immediately following the rupture in ectopic pregnancy, that the pain and shock are greater than the rupture of an appendiceal abscess or intestinal perforation? While to the patient and friends the pain is the most alarming symptom, it pales into insignificance compared with the hemorrhage. The pain is the red light, the hemorrhage is the wreck. The hemorrhage is caused, not by the rupture *per se,* but by the separation of the fetal membranes. There is no contractility of the tube, hence the blood flows out in great profusion, and usually does not cease until a clot is formed, which, in its unstable position, easily gives way and hemorrhage recurs. The patient often becomes pale and anemic with thready pulse and cold perspiration.

Treatment.—Either before or after rupture there is but one line of treatment which will do any good, and that is surgical. Oxytocics, adrenalin, and other drugs are perfectly useless with one exception, namely, morphia. A good hypodermic of morphia will put the parts at rest, control to some extent the hemorrhage,

will do good, and should be given for temporary relief.

When, as rarely happens, the diagnosis is made before rupture takes place the treatment is simple, and the mortality is almost nil. I shall not describe the method of procedure or the technic of the operation to this intelligent body of physicians. If rupture has taken place and the patient comes into the hands of the surgeon soon after, as is usually the case, the technic and the steps of the operation are not very different from an ordinary laparotomy. But the patient is in a grave condition, and the operation is a grave one. Hence, I would council accuracy and rapidity in work, and I wish to emphasize the necessity in many cases of thrusting the hand down through the pool of blood and securing the blood vessels before attempting to mop out or otherwise remove the blood and blood clots.

I think drainage as a rule should be employed after a laparotomy for extra-uterine pregnancy.

FOR DISCUSSION, SEE PAGE 194

POST-CLIMACTERIC HEMORRHAGES: THEIR CAUSE AND TREATMENT

A. L. WRIGHT, M.D.

CARROLL, IOWA

Uterine hemorrhages occur and continue at variable intervals, after the period when a woman's menstrual life should cease. The persistency of the flow and the frequency of its occurrence give alarm to the patient and friends in increased ratio to the amount of blood lost and the length of time it has continued. While the discharge at any one time may not be great the constant flow as certainly saps the vitality and energy as the continuous dropping wears the stone. The persistent oozing of blood, or the occasional loss of a large quantity, not only undermines and exhausts a woman's vital resources, but disturbs metabolism to so marked a degree as to lessen her resistance to the invasion and ravages of other disease. It is a well-known fact that uterine hemorrhage, taking place at the time of the menopause or after its establishment, is one of the early symptoms or precursors of the invasion of serious and ofttimes grave local complications. The sudden loss of a large quantity of blood frequently so disturbs the blood-forming organ or causes such havoc to the nerve centers presiding over the same as to give rise to grave and fatal changes in this vital fluid. This can best be emphasized by a brief report of a case now under observation.

Mrs. B., 54 years of age, quadripara, the youngest 18, had enjoyed uniformly good health until eight years ago, when she noticed that her menstrual period was prolonged and occurred more frequently than former-

ly. Later the flow was more profuse and exhausting, until finally there was a continuous discharge, with an occasional severe hemorrhage that fairly drowned her. This continued for two or three years.

The woman had a pale and cadaverous look that impressed the casual observer that she had some serious malady. She invariably declined surgical aid, when offered, until she was so reduced that she was bedfast most of the time when she consented to a curettement. The uterine hemorrhage immediately ceased, but the general condition of the patient did not improve. She continued to look pale, as though every drop of blood had escaped from her veins. She complained of shortness of breath on the least exertion. The appetite was poor, and the temperature varied from subnormal to a degree and a half above normal. She complained of great weakness and inability to get about. Feet and legs were swollen to the knees. An examination of the thoracic and abdominal viscera was negative, except an anemic murmer. Chemical and microscopical examination of the urine was also negative, except that the percentage of urea eliminated was much below normal. The blood count showed 7000 white, to 1,-800,000 red, the large number of white corpuscles being suggestive of a leucocytosis or a suppuration taking place somewhere. This, however, we were unable to demonstrate and believed it a part of the diseased process. Cabot reports two such cases where the white corpuscles were greatly in excess, and the relative proportion much increased. In the microscopic field were seen normoblasts and megaloblasts. Ehrlich views their presence in the blood of an adult as a symptom of degenerative metamorphosis. In addition, the red-blood corpuscles were undergoing some form of retrograde change. They were ragged, irregular, and crenated. The percentage of hemoglobin was reduced to thirty.

The above clinical picture is a sad commentary upon a neglected and typical case of pernicious anemia that had its foundation laid during the trying time of the establishment of this woman's menopause, and exemplifies the point we are trying to emphasize, not to neglect uterine hemorrhage taking place at the so-called critical time in a woman's life, or continuing for a considerable period after the age-limit has been passed.

This condition should not be passed over lightly as due to the change of life, without careful investigation, when it will be discovered that some pathological change is taking place which will account for the hemorrhage. My patient will no doubt succumb to a progressive pernicious anemia that might have been averted had a proper interpretation been given the persistent hemorrhage of the menopause period. We do not maintain that the hemorrhage, *per se,* leads up to the present condition of our patient, but it laid the foundation that indirectly, through the nerve centers presiding over the blood-making process, rendered possible the condition that now exists. This woman, like others, thought for years that her profuse flowing was incident to her age, and in due time would cease. I firmly believe that we, as physicians, should educate the laity that hemorrhage is not a necessary concomitant of the menopause, and when it occurs there is a diseased condition existing that demands attention.

The menstrual life of the average female of the United States begins at about 14 years of age, and lasts until she is 45, when it stops. The establishment of the flow should and will be without symptoms in a girl with healthy pelvic organs. The same is true with the climacteric. According to Currier menstruation, should cease gradually and without pain or other clinical symptoms provided there is no disease in the pelvis. When a woman complains of pain or

of an undue distress accompanied by a discharge containing blood in varying quantities, at regular or irregular intervals, this is presumptive evidence that there is some disease process taking place in her pelvic viscera which should have our serious consideration and be corrected, if possible, in order to vouchsafe the welfare and safety of the patient. The early diagnostic symptoms of definite pathological changes are exceedingly unreliable, and require great care in arriving at correct conclusions. It is at this time that resort to early surgical interference is of the utmost importance, and our ability to show a large percentage of permanent cures depends upon the promptness of our action, and stands as a living monument to the surgeon's acumen.

The diseases a woman is most liable to during her menstrual life are of a benign type. The early recognition of their true character and the thorough eradication of every vestige of disease will generally give complete and permanent relief. Many grave pathological changes that take place in the pelvis date their origin prior to the establishment of the menopause. Excessive flowing at this time is too frequently passed over lightly, and attributed as incident to the "change of life." The escape of blood from the female genitalia after the climacteric, is always a foreboding of evil. The same applies with equal force to an excessive flow continuing at the time of life when menstruation should cease. A profuse flow at each period or at irregular intervals must be looked after. Too much stress cannot be placed on the importance of early recognition of the significance of hemorrhage at this time, or post climacteric. It is generally the forerunner of carcinoma of the uterus, a disease that, if recognized early and properly dealt with by complete extirpation, will result in 33 1-3 per cent of permanent cures according to Cullen. But if neg-

lected and temporized with until the disease has reached beyond the confines of reasonable surgery, it will, with equal certainty, result in death.

Menstruation should cease with little or no disturbance to a woman's physical comfort, the same as this physiological function is established at the beginning of her menstrual life. When she suffers physical discomfort in the pelvis or loses an abnormal amount of blood, there is something diametrically wrong. The intensity of the suffering and pain bears no relation to the extent of tissue involved, nor the serious character of the disease. The pain should not be looked upon as the standard by which the gravity of the situation is measured, any more than should the amount of blood lost be the index to the diseased condition of the pelvis. Grave and even fatal changes take place with the loss of but a small amount of blood, while most of the benign conditions are attended with the loss of much blood, hence the unreliableness of this sign except as an indication for investigation. Each case is a law unto itself and must be carefully studied, separately and independently of all others. When a woman reaches the fifth decade of life and flows excessively, the discharge being accompanied with pain or not, as the case may be, you can be certain that there is some abnormal process taking place which demands attention in order to insure her safety. Complaints at this time are frequently thought to be the wail of the neurotic, and are partly or entirely ignored until the disease has wrought such havoc to the involved organ and contiguous structures as to place the patient beyond relief. The symptomatic manifestations are due to actual pathological changes which, if recognized early, are amenable to proper treatment. We must not overlook the fact that it is at a time when the average woman's vital resistance is lowered that degenerative changes are most apt to occur.

An enlarged cervix that has been lacerated during a former delivery and has undergone areolar hyperplasia is one of the frequent causes of post-climacteric hemorrhage. The scar tissue in such a cervix is so dense and unyielding that the vessels cannot collapse and stop the escape of blood, nor will it firmly hold the thrombus that forms in the open vessel mouth. This plug is readily dislodged by the slightest exertion or effort on the part of the patient. These women are usually free bleeders, and lose large quantities of blood, owing to the uncollapsable condition of the sinuses. The vessel mouth remains open and the blood pours forth. Hemorrhage due to subinvolution of the uterus and cervix usually begins before the climacteric and prolongs its establishment years after menstruation should cease. Amputation and removal of such a cervix, and all scar tissue connected therewith, is the only treatment that will give permanent relief.

The endometrium undergoes inflammatory changes that result in fungosities and polypoid development that are frequently the sole cause of hemorrhage. This degenerative change may take place any time during the menstrual life of woman, but is most frequent toward the close, from 35 to 45 years of age. We should be on our guard in those cases, and not be led to believe carcinoma exists. If in doubt, the uterine scrapings must be subjected to microscopic analysis. These fungosities will prolong menstruation beyond the time when it should cease. The loss of blood is generally excessive, and seriously depletes the patient and increases her liability to other disease, as in the case reported at length early in this paper. The ordinary septic endometritis occurs earlier in life, and is not accompanied, as a rule, with hemorrhage.

We must not overlook the post-climacteric endometritis of old women. They have a mucopurulent

discharge containing blood in varying quantities, which suggests malignancy. In these cases the odor is very offensive and much like that of early cancer. The hemorrhage is never large, the foul-smelling discharge being merely streaked with blood. A differential diagnosis must be made from the uterine findings. These cases sometimes exhibit septic symptoms that are readily understood when we consider that these women have suffered for years from retrodisplacement of the uterus, which interferes with its drainage and gives rise to the clinical manifestations. Great care should be exercised in examining these old women. The clinical history is so characteristic of cancer that the real condition may be overlooked, and they may be subjected to a serious operation unless the true condition is recognized.

When the hemorrhage is due to a fungoid degeneration of the endometrium, the cervix should be carefully dilated under an anesthetic, after the usual preparation of this class of patients for clean surgical work, with a steel dilator, care being taken not to lacerate the cervix. With a curette the uterine mucosa is carefully gone over and every vestige of polypoid development removed. These fungosities are small in size, not larger than from a grain of wheat to a navy bean. The uterine cavity should be thoroughly wiped out with gauze passed in on a probe and twisted around until it comes away clear and free from granulation tissue in its meshes, or if you can get the finger into the uterus with a piece of gauze over it, that makes the best kind of a curette. Swab the cavity thoroughly with tr. iodine or 95 per cent carbolic acid. followed with alcohol. Care must be exercised not to burn the vaginal mucosa. A small wick-drain or silkworm gut may be inserted to the bottom of the uterus if thought best. This I have rarely found necessary if the position of the organ was such as not to interfere with good drainage.

I wish to emphasize the necessity of giving the patient an anesthetic. A woman cannot endure the pain incident to a thorough dilatation of the cervical canal and proper curettement without the same. The lacerated cervix usually found in these patients should be repaired, not with the idea of effecting a cure, but to cinch the cure already made and to keep the patient well.

The part played by the arteriosclerosed hardening of the blood vessels as an etiological factor in post-climacteric hemorrhage has been a mooted question. If Jacobs is correct in his contention that the septic endometritis of an old woman is due to this condition of the blood vessels, we should meet with cases of severe uterine hemorrhage due to this cause oftener than we do. As a clinical experience this condition is rarely met with. These women do not lose much blood. The discharge is merely streaked with the same. I can readily understand how these brittle and easily broken vessels can keep up a severe and long-continued hemorrhage, owing to the inability of the intima of the vessel to collapse and close its gradually decreasing lumen. A more reasonable hypothesis, however, is offered in those cases of subinvolution where the hardened and unyielding uterine tissue prevents the vessel from collapsing. I am constrained to say that comparatively few women suffering from post-climacteric hemorrhage due to an arteriosclerosis ever came under my observation.

Carcinoma of the uterus is the most frequent etiological factor of post-climacteric hemorrhage that we encounter. Dr. Welch has expressed his belief that of all primary cancers one-third are situated in the uterus. Before the histological character of malignant growths was known they were supposed to be a local manifestation of some constitutional dyscrasia. The virus was circulating in the blood. Some local influence or disturbance in metabolism caused it to

localize. Removal of the involved organ had no influence on the progress of the disease, as it would return elsewhere. The consensus of opinion now is that beginning cancer is primarily a local disease, and that its early removal not only relieves the primary foci of infection, but greatly lessens the liability to metastasis, and is the only treatment to pursue. While no age is exempt from malignancy of the uterus, it is by far more prevalent during the years from 40 to 60. The table of Gusserow, quoted by Pozzi, indicates that nearly twice as many cases develop during the fifth and sixth decades of life as in all the balance.

One of the first symptoms of uterine carcinoma is hemorrhage. Rarely does it give rise to the loss of a large quantity of blood at first. The early show is slight and may manifest itself as a continuous drizzle. When profuse hemorrhages occur the disease is far advanced and in most cases beyond the ken of surgical interference. When once the disease is outside the confines of the uterus there is little hope of more than a "stay of proceedings."

Cullen calls our attention to the striking regularity of normal menstruation in women who develop carcinoma after the menopause.

An enlarged lacerated cervix that has a firm, hard, nodular feeling should be looked upon as suspicious. Many of these cases are operated upon under the impression that the symptoms are due to the laceration and its concomitants. The removed scar tissue should be examined by an expert pathologist, and if an error has been committed, it should be corrected. After this nodular tissue begins to break down and the finger is found to be stained with blood, the diagnosis is readily made. Then it may be too late for permanent results, and this is what we are striving for.

It is inadvisable to make sections from a suspicious growth with a view to determining its true character.

In a case where scar tissue has been removed from a cervix in a woman near the menopause, and has a suspicious feel, I advise microscopical examination and act upon the findings, removing the uterus if necessary. The same is true where fungosities are removed with the curette, but if any suspicion exists that we may have a malignancy, such a course is to be deprecated. The primary cause and histogenesis of cancer are so little understood, and the danger of diffusing the cancer cells by opening up new areas for invasion is so great that it must not be resorted to. If the diagnosis can be made at an early date the permanent cures will be from 13 to 66 per cent, according to Cullen, Pozzi, and others. As the diagnostic technic becomes more accurate we are enabled to arrive at correct conclusions at an earlier period in the history of cancer. I am so optimistic that I believe the percentage of permanent cures will greatly exceed that of the quarter century just past. Twenty-five years ago a permanent cure of cancer of the uterus was unknown. To-day every operator has cases that have lived long beyond the three year limit, and he points to the record with pride. This he has been enabled to accomplish by the acute diagnostic acumen of the general practitioner, who first sees these cases.

Fibromyomata of the uterus are the most common growths women are subject to, and are the most frequent cause of a prolonged menstrual life and post-climacteric hemorrhage. Kolb is of the opinion that in at least 40 per cent of women past 50 years of age these benign tumors are found. Their existence is usually discovered by accident. From a clinical standpoint it is not necessary to differentiate their histological formation, as we are interested in them only as an etiological factor to hemorrhage after the change of life. These tumors vary greatly in size, and may exist for years without giving rise to symptoms. In fact they are discovered after the climacteric

by the patient commencing to bleed for the first time. Usually, however, these women flow longer at their menstrual period than their more fortunate sisters who have none. The amount of blood lost is also greater, especially in the polypoid, submucous, and interstitial varieties.

A not unusual history for this class of patients to present is, that in early life their menstrual periods were regular, always profuse and painful, and lasting three or four days. As the time arrives the menopause does not appear. In place of stopping, the flow gradually increases each succeeding month, until at 50 years of age the menstrual discharge continues from ten days to two weeks. These women usually endure this uncomplainingly for a year or two when other symptoms follow, such as swelling of the feet, shortness of breath, especially on exertion, attacks referred to the heart, as a sense of weight in the precordium, gasping for breath, pallor, and great weakness compel her to seek the advice of her physician. Another noticeable thing is the fact that these women do not lose in flesh and weight.

In another class of cases the menopause has been established for years during which time there has been no show, when suddenly there is a reappearance of the flow, and the woman thinks she is renewing her youth. How misguided, for in all probability what was for years a benign growth has taken on malignancy, and is carrying her down to certain death. The amount of blood lost is not great at first, but later becomes more profuse and may even threaten life. There is more or less pelvic pain and vaginal discharge. Delay in resorting to operative interference at this time. is attended with great danger.

Uterine fibroma usually undergoes a progressive retrograde disintegration at and after the menopause, until years later but a mere outline of the former tumor can be found. This does not always occur.

Occasionally they take on malignancy or become necrotic. In both instances the blood-stained discharge is exceedingly offensive. A pre-existing fibroid that has remained quiescent for years and suddenly springs into activity, is to be looked upon with suspicion and dealt with by complete ablation of the uterus and adnexa, as well as the lymphatic glands, especially those in the folds of the broad ligament. Those situated at the point where the uterine artery is given off from the internal iliac must be carefully dissected away. If enlarged glands are found higher up they should be removed, otherwise a local recurrence or a metastasis will occur, and our efforts will avail nothing. Absolutely no chance can be taken with these quiescent benign growths that later in life spring into activity. They are malignant, and must be dealt with as a primary carcinoma. I believe they are intensely more virulent and rapidly fatal in their progress. As has been shown elsewhere the final result depends entirely upon the early diagnosis, and ought to increase our zeal to get rid of all suspicious uterine growths as soon as possible.

In conclusion, let me urge a more careful and thorough investigation regarding the cause of uterine hemorrhage occurring in women who have passed the change of life, as well as in those where the climacteric is unduly prolonged. This is necessary in order to attain the highest results possible based upon a thorough scientific study. The generative organs of a woman at this time should undergo trophic changes that result in complete quiescence. All activity should cease, and the genitalia "become as a child again." The usual physiological degenerative atrophy does not always take place as it should, but assumes a dangerous activity from pathological conditions in the pelvis that should cause alarm and arouse suspicion that a serious condition exists, and the safety of the patient

depends upon the accuracy of our diagnosis and promptness of action.

While the early symptoms are not uniformly reliable the gravity of the situation is such that we had better err on the safe side than delay in order to make a positive diagnosis. In many cases early clinical recognition of carcinoma is impossible, hence, as has been intimated throughout this paper, the radical operation should be done whenever in doubt regarding the character of the disease. In the hands of a skilled surgeon the risk is small while the patient is yet in good condition. It is safer to remove an occasional uterus unnecessarily than to permit the many to die a horrible death in order to make a positive diagnosis.

DISCUSSION OF THE TWO PRECEDING PAPERS

Dr. B. B. Davis, of Omaha, Neb.—Although I have been very much interested in both papers, I will confine my remarks to the paper of Dr. Wright. When the subject of carcinoma of the uterus comes up, if there is anything in the field of surgery concerning which we need to do a good deal of missionary work among the laity, it is with regard to the question of cancer. Almost all the laity, it seems to me, consider that the diagnosis of carcinoma is equivalent to the death knell, and unfortunately this has been largely true. The paper of Dr. Wright is in line with what we need, a warning to the profession that when certain conditions arise our suspicion should be aroused, and we should not rest satisfied until we have cleared up the case and ascertained whether or not carcinoma exists. Every case of irregular hemorrhages from the uterus, for instance, especially hemorrhage coming after the post-climacteric period, should at once arouse suspicion, and the weight of evidence immediately is that carcinoma exists, but, of course, we have to clear up the case. Now, it seems to me, if we could impress more fully on the general practitioner, as well as on the body of surgeons throughout the country, the necessity of taking warning immediately, and not rest easy in these cases until the diagnosis is absolutely made, it would do very much to help us along. Unfortunately, the mortality from carci-

noma is very high. It is so high as to be one of the most discouraging fields in which we have to work. But, on the other hand, if we could once get the medical profession and the laity to believe these two points, it would materially assist us, namely (1), that carcinoma primarily is a local disease; (2) that every person dying of carcinoma could have been cured by a timely operation. I believe those two propositions are absolutely correct, and if we could only get to the point that the general public would work along with us, if we could get the newspapers to advertise in connection with carcinoma that an early operation, like an early operation for appendicitis, would materially reduce the mortality, we should accomplish much. At the present time our success in the treatment of carcinoma does not depend so much upon how to do extensive operations in the cases that are going to die from recurrence of the disease as in trying to get the cases early, making the diagnosis early, and doing an operation while the disease is still local, and in that way cure cases; whereas, as it is now, the disease has usually extended beyond any point that we could operate safely.

Dr. D. S. Fairchild, of Des Moines, Iowa.—Referring to Dr. Wright's paper, there is one point on which I desire to express an opinion. My feeling upon this subject is that when the change of life has been thoroughly established and hemorrhage occurs, it should be assumed that the disease is malignant, and that we should be satisfied to the contrary only on presentation of positive evidence. If we assume the condition to be suspicious and investigate the case, we may be mistaken, but if we go on the assumption that it is malignant, and disprove it if we can, we are taking safe ground. If we have a hemorrhage which occurs at the close of the menstrual life and is somewhat excessive, we may take the other end of it, and establish the existence of carcinoma before we operate. I feel, however, that the question is too serious to be taken merely as a matter of suspicion, and establish the fact, based upon a suspicion, but I would rather assume malignancy to start with.

Dr. O. Beverly Campbell, of St. Joseph, Mo.—I want to say a few words on the paper of Dr. Andrews. The doctor, in reporting his case, questioned whether he did right in delaying operation twenty-four hours after diagnosing his case. If the doctor had a good nurse in attendance, instructed to be on the alert for evidence of a recurrence of hemorrhage,

I consider that he did right in postponing operative measures twenty-four hours. These cases should be closely watched, because there is always danger of the recurrence of hemorrhage. I cannot quite understand why the doctor should have found hemorrhage occurring at operation, as he reported the pulse, temperature, and general symptomology of his patient improved by waiting the twenty-four hours, which certainly meant that hemorrhage could not have gone on during that time. The rule is that the primary hemorrhage is arrested by a thrombus forming in the site of rupture, which arrests the hemorrhage, and it is the evidence that we have of such an occurrence which allows us to await reaction on the part of the patient before resort to operation. So that I cannot quite understand why the doctor was so particular in making a large incision, and having a first-class assistant on hand, when the evidence in his case was in favor of the hemorrhage having ceased by the formation of the clot in the ruptured tube, before he undertook his operation.

I take issue with him in regard to another claim, namely, that the operation for ectopic pregnancy is always a major one. This may be true, especially after the lapse of three months, the fetus being still alive and the placenta attached to the intestines. It is then one of the most formidable operations in surgery, but the operation at the usual time of rupture, about the tenth week, is one which requires simply the opening of the abdomen, the ligation of the ovarian artery, and usually the removal of the ruptured tube.

Of course, when it is necessary to operate in the presence of hemorrhage, owing to the weak condition of the patient it is necessary to operate quickly, and arrest the hemorrhage by ligating the ovarian artery as quickly as possible.

I have had sixteen cases of ectopic pregnancy, and these few cases have not borne out all of the teaching upon the subject, especially regarding the position of its occurrence in women who have been barren for ten years, it being noticed but once in my sixteen cases. I recall one case in which a woman had a five months' old baby, had menstruated at the end of three months following its birth, and had become pregnant in the left tube, rupture occurring when her nursing baby was five months old.

There is another point in the symptomology given by the essayist that does not agree with my experience, and that is that there are no symptoms other than those of ordinary pregnancy up to the time of rupture of the tube. In my case there was a history of discomfort and some pain in the tube

in which impregnation had occurred. And further, preceding rupture there was the occurrence of slight hemorrhage and the casting off of small portions of the decidua preceding the rupture of the tube. At the time of rupture pain was pronounced and marked hemorrhage occurred. I operated on fifteen of my cases with fourteen recoveries. The patient that died had become infected, general peritonitis being the cause of death.

In regard to Dr. Wright's paper, there is nothing in the paper but what should receive our commendation; yet I will say that the presence of hemorrhage from the uterus, when adenocarcinoma exists, is most usually indicative of advanced carcinoma, and radical measures are liable to prove fatal. This may not always hold good, especially in carcinoma of the fundus, but in carcinoma of the cervix where lymphatic spread occurs early it will usually hold good. In epithelioma of the cervix the spread to the lymphatics is slower, and hemorrhage may not be a contra-indication to radical removal of the uterus and its adnexa.

Dr. H. G. Wetherill, of Denver, Colorado.—I wish to say a word or two in endorsement of the position taken by the reader of the paper, Dr. Wright, in reference to early diagnosis and early operation, and also with regard to the suggestion made by Dr. Davis, that the important thing for us to do is to educate the public to the acceptance of the fact that post-climacteric hemorrhages usually have a serious significance, and that a great deal may be done for them if these patients are seen early. Furthermore, in my judgment many of these cases should be operated upon. If early operation is done by a proper method, we have an excellent chance, not only for the prolongation of the life of the patient, but the chance of a radical cure, which Dr. Campbell has said Baldy places at sixteen per cent, and the Johns Hopkins people place at ten per cent. In any event we have an opportunity for making the worst of these patients infinitely more comfortable for their few remaining days.

I would make this difference between doing a radical operation and a palliative operation: If the uterus is fixed and there is evident extension of the disease, particularly if there be metastases, there can be no object in doing hysterectomy; in fact hysterectomy done under those conditions will hasten the death of the patient; but there is another operation which we can do, and which will do them great good. They are suffering from hemorrhage and sepsis, and

we know the good results that follow complete curettement and cauterizing the parts after the curettement has been done. Occasionally I use in cases of this kind the calcium carbide treatment, recommended by the late Dr. Etheridge.

I desire to again call the attention of the Association to the use of the Downes' clamp. In the East, particularly in Philadelphia, the clamp has become a very popular instrument in cases of cancer of the uterus. I have had it in use for about three years with the greatest possible satisfaction. No man in this country has attained the excellent results in the way of complete cures of cancer of the uterus that were obtained by Byrne of Brooklyn. Byrne obtained these results through the use of a cautery clamp somewhat resembling that of Dr. Downes. I have used the Downes clamp long enough to be satisfied as to its complete hemostatic action. It has two great advantages in cancer of the uterus, first that it absolutely closes the lymphatic channels which lead away from the growth in the broad ligaments on either side, second that it does away with the very great danger of implantation of carcinomatous tissue into the raw surfaces. If the operation is done by the Downes method throughout, that is, the vagina separated from the uterus by the Downes cautery knife, and the broad ligaments clamped on either side with Downes clamp, it leaves only seared surfaces in which implantation is not likely to occur. I understand that this instrument has not been used very much in the West. It is one that many of you will appreciate however and if you have not used it, I would urge that you do so.

Dr. William E. Ground, of Superior, Wis.—Just a few words in reference to the first paper. The promiscuous administration of strychnia, especially in conditions of shock due to hemorrhage before the bleeding is safely checked, is to be deplored. I understood Dr. Andrews to say he gave one-thirtieth grain before he operated. My experience in tubal pregnancy involves 29 cases, most of which were operated upon after rupture had occurred, and I observed those cases did best that were promptly operated upon without previous interference in the way of strychnia and salt solutions; in fact, no matter how nearly exsanguinated the patient appears to be, unless the nervous energy of the heart has been exhausted and the blood vessels pumped dry by strychnia, we may almost surely count upon our patient's recovering. Get into the abdomen and check the hemorrhage quickly and *then* give your salt solutions and strychnia. These are ideal cases to operate upon, because the blood vessels are com-

paratively empty, and will greedily imbibe liquids from almost any source as soon as the leak has been stopped.

As to the advisability or removing the tube in case of ruptured tubal pregnancy or tubal abortion, I deem it rarely necessary. The rents can be nicely and safely repaired by suture, as I have many times done and the patient saved a mutilating operation.

The popular impression among physicians that a diagnosis of tubal or ectopic pregnancy can be made from the examination of uterine scraping is fallacious. The decidua is merely hypertrophied endometrium, which, as we well know, may arise from a number of causes besides pregnancy. Chorionic villi being purely a fetal structure would be a positive microscopical indication of pregnancy, but these structures are not found in the uterus unless the ovum is there.

Dr. J. F. PERCY, of Galesburg, Ill.—There is a class of cases of uterine hemorrhage that has not been spoken of by the essayist, but which, perhaps, ought to be considered in this connection, and that is the cases we see occasionally where women before the climacteric begin to bleed, and they are curetted. A microscopic examination of the scrapings in this class of cases does not clear up the diagnosis, except to exclude malignancy. After curettement these cases will usually go two or three months without the continuous bleeding. They will have apparently normal menstruation again; perhaps they will go longer than this, but they will begin to bleed again. These patients are usually past thirty years of age. In the two that I have had the women were thirty-five years of age. Both were curetted twice, and yet it did not stop the hemorrhage. I used what is known as stypticin (cotarnine hydrochloride) recommended by Bolt in the N. Y. Medical Journal for February 25, 1905, but with no result. These cases finally came to hysterectomy. I cannot recall the exact report of the pathologist, but in both there was found an atheroma of the uterine vessels and atrophy of the uterine musculature. Neither of these women had ever been pregnant. My point is that the question of malignancy will come up in this class of cases because of the hemorrhage. I do not think that as a class they have been worked out, and it is well, I think, to consider them in connection with a paper of this kind.

DR. A. W. ABBOTT, of Minneapolis, Minn.—You all know too much about the subject of extra-uterine pregnancy for me to discuss it; but I will mention certain conditions which have

interfered materially with the diagnosis in some suspected cases of extra-uterine pregnancy. Twice I have encountered pelvic hematocele, which, on careful investigation, was found to be due to a violent fall or following it. In one of those cases there was a small fibroid.

Another condition which confused me was the tip of an inflamed appendix attached to the right horn of the uterus. You can appreciate the similarity of symptoms that would ensue.

Another case was a twisted Meckel's diverticulum attached to one Fallopian tube. Another was a twisted hematosalpinx. Of that condition several cases have been reported from time to time which have misled the diagnostician.

I think the most confusing condition, however, I have met with is a combined intra-uterine and extra-uterine pregnancy, and unfortunately it occurs at a time when the symptom of fluctuation in the uterus, which is our best and earliest positive sign, is hard to make out.

Dr. Wright (closing the discussion).—I wish to thank the gentlemen for their kind appreciation and discussion of my paper. It was remarked by one of the participants in the discussion that when hemorrhage occurs it is rather late. It may be late for operative interference in uterine carcinoma. That is perhaps true, but the facts are that ninety-nine patients out of every hundred come to us because of hemorrhage They do not suffer from pain, but it is the hemorrhage for which they primarily consult the physician.

I did not attempt to classify the various pathological conditions encountered, nor did I attempt to detail any particular method of operative interference. Each member of this Association undoubtedly has his particular operative technic, which he would follow in such cases. The main object of my paper was to make a plea for a careful investigation of post-climacteric hemorrhages, and to operate on these cases promptly. I believe that they are of malignant origin, and that the uterus should be dealt with by ablation.

A METHOD FOR THE CORRECTION OF CICATRICIAL TALIPES CALCANEUS

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OMAHA, NEBRASKA

The method for the correction of some forms of old talipes calcaneus is illustrated by the following two cases:

CASE I. A. B., aged twenty, was admitted to the Methodist Episcopal Hospital with the following history:

When four years of age the dorsum of the right foot and the lower third of the anterior aspect of the leg was severely scalded, producing a sloughing of the skin from the entire burned area. The resulting wound was a long time in healing, which was accomplished by granulation ending in a dense mass of cicatrical tissues, which, in contracting, produced an extreme dorsal flexion. After the lapse of several years two different attempts were made to correct the deformity by making a transverse incision, dividing all the soft structures down to the tibiotarsal joint. The foot was brought down to its normal position. The separation of the wound margins was so great as to produce a large gaping defect over the dorsum of the foot. In spite of the attempt made to maintain a corrected position of the foot by means of variously constructed devices, a deformity recurred as soon as the operative defect closed over, which it could do only by a process of granulation and cicatrical contraction.

At the time of his admission the following condition was noted: The right foot was in extreme dorsal flexion and very moderate varus position. The

dorsum pedis was nearly in contact with the anterior aspect of the leg, and was held in this position by a thick, dense mass of scar tissue which seemed intimately adherent to the tibia and the tarsus and metatarsus of the foot. The heel was drawn down so that the os calcis occupied a vertical position, and the superincumbent weight was borne on the end of the bone. The posterior portion of the articular surface of the astragalus could be felt under the tendo Achillis. In fact the backward pressure of the astragalus was indicated by an elevation, making a visible posterior projection against the tendo Achillis. The foot was rigid in the extreme, and dorsal or plantar flexion could be made only to the slightest degree. The phalanges were limp, and could be, voluntarily, neither flexed nor extended. The deformity was due entirely to a dense cicatricial mass involving the skin and all the soft structures and including the periosteum to which it was attached. This scar tissue involved an area beginning at the junction of the lower and middle tibial thirds surrounding nearly one-half of the leg, and extending downward to the middle portion of the metatarsus.

TREATMENT

After the usual preparation of the operative field the following procedure was adopted. It was evident that a flap must be constructed to cover at least the greater part of the resulting tissue defect, which seemed unavoidable in severing the constricted structures. A pedicle flap, to be turned or twisted so as to fit over the resulting defect in this avascularized tissue, was out of the question. It was evident that a flap with a broad attachment was necessary. The only one available was a triangular flap so constructed as to cover the tibio-astragaloid joint, when it should be opened, as it must be, where the scar tissue reached down to and involved the entire thickness of the joint capsule. Accordingly an incision was made, begin-

ning at the upper end of the scar tissue and extending obliquely downward and outward to the lower end of the outer malleolus (Fig. 1). Another incision, beginning as before, but extending downward and inward to the lower end of the inner malleolus was made. The skin was now seized at the upper end of the in-

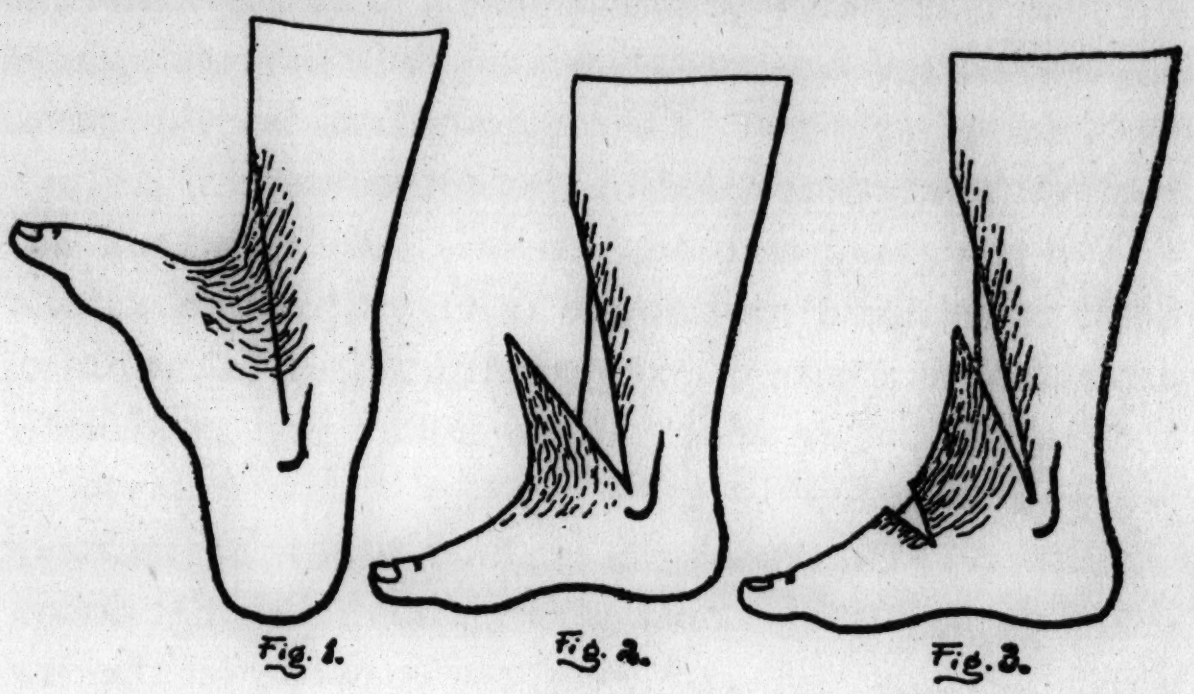


Fig. 1. Fig. 2. Fig. 3.

cisions and was dissected, including all the tissues, to the periosteum, downward and below the tibio-astragaloid joint, creating a triangular flap. The remaining resisting structures over the joint were divided, and with little difficulty the foot could be forced into its normal position. The triangular flap, which was stiff, projected away from the ankle joint like an elongated slipper-flap and could not be pressed against the tibial surface nor the joint (Fig. 2).

It now became apparent that our flap would be useless unless it could be pushed upward. Accordingly a transverse incision was made over the middle portion of the metatarsus, beginning over the middle part of the first metatarsal and continuing across the foot to the same point on the fifth metatarsal bone. The integument was now dissected from the bones so that the entire flap could be lifted, except by its lateral ends, which made it a double-pedicle flap. The flap could now be easily pushed upward so that it completely covered the tibio-astragaloid joint, leaving only an in-

verted-V-shaped defect above, and a small elliptical wound below. (Fig. 3.)

The wound was now dressed with an aseptic dressing and fixed on a Volkmann posterior tin splint. Every portion of the flap healed. About ten days later when the uncovered portions of the wound had become filled with granulations, a transplantation of Thiersch flaps was made, which very soon completed the healing process. The outcome has been a useful foot with no recurrence of the deformity.

The foregoing method, which is simple and not difficult to do nor a new one, was suggested by a similar procedure in a case of exaggerated talipes calcaneus of congenital origin which came under our care some years previously.

CASE 2. The case was that of a boy of fourteen years of age. The heel was pointed directly downward, the superimposed weight was borne on the end of the os calcis. The foot was in extreme dorsal flexing, and appeared more like an abnormal appendage than a foot. The contracture of the soft parts on the anterior aspect of the leg was extreme. Efforts at manual correction were entirely ineffectual.

It was determined to do under general anesthesia a subcutaneous tenotomy on the unyielding tendons. Accordingly, after the usual preliminary preparations, a subcutaneous section was made of the tibialis anticus, the extensor proprius hallucis, the extensor longus digitorum pedis, and the peroneus tertius. This seemed to relieve all the resisting structures except the skin. In attempting to correct the mal-position the integument at the tibio-dorso-pedal junction would not yield, and, wishing to avoid a skin laceration, a triangular flap with its point upward was dissected away from the anterior tibial aspect, reaching downward to an imaginary line extending from one malleolar tip to the other and exposing the ankle joint. The foot was now easily brought into its normal position.

This covered the joint completely, and extended to a considerable distance above it. An inverted-V-shaped defect was created along the lines of incision. This defect was covered one week later with thick Thiersch flaps.

The idea of the use of a triangular flap to correct deformities due to cicatricial or atrophic skin, is not new. The possibilities of its use have probably not been fully realized. Experience has long ago demonstrated the uselessness of the transverse incision of the contracted skin. Nothing can be expected of such a procedure other than a speedy recurrence of the deformity by the formation of new scar tissue in the resulting gap. If a triangular flap of sufficient length be created which will not only completely cover the affected joint, but will extend a considerable distance above it, and if we then cover the resulting V-shaped defect with thick Thiersch flaps, we may confidently expect a permanent correction of the deformity. The flap should be long enough. Its point should begin no lower down than the junction of its lower and middle third, and I can imagine cases where it may be advisable to begin the incision over the middle of the tibia. The flap must be long enough so that an elastic covering lies over the tibiotarsal joint.

The fear that such a flap may slough is not borne out in practice. It is true, we sever the return circulation in the skin. We were fearful of such a result in our first attempt and again in our second cases, which possessed the additional defect of being ill supplied with blood vessels on account of the cicitricial nature of the flap. In neither case did any part of the flap slough. This can be accounted for only by the assumption that union of the flap and the structures which it covered, took place very early. When the flap is elastic and pliable, as it usually is in non-cicatricial skin, the V-shaped incision is sufficient. When, however, the flap is cicatricial, stiff, and un-

yielding, and will not cover the defect without pressure or tension on it, it becomes necessary to make a trans-dorsal incision, as detailed in Case 1, and detach it entirely except on each side in order that the circulation may be maintained. The flap will drop of its own weight against the joint. This procedure constitutes the real and only modification and addition to the old triangular flap method.

It is important that all these flaps fall into position of their own weight. Pressure or tension defeats the healing process. The base or flap attachment should be broad. While in both cases the base was directed in a distal direction, it would seem, when possible, the base should be in a central direction, on account of the more favorable condition for the venous return. When the triangular flap is used for ankle-joint deformities, the base line should always extend from one malleolar tip to another, (1) because all resisting tendons, ligaments, and other resisting structures can be easily severed; (2) because there is no tension in any portion of the flap; (3) because the tibio-astragaloid joint can be exposed, and should it be deemed necessary to do an arthrodesis, as is sometimes required in paralytic or recurring deformity, the articular surfaces can be easily removed with a chisel, and an ankylosis of the joint may confidently be expected.

RESTORATION OF THE PERINEUM

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The anatomy of the female perineum has been sadly neglected in text-books and treatises on anatomy. Almost without exception the male perineum has always received careful attention, doubtless because the old lateral operation for stone in the bladder was one of the most successful and frequently performed operations since the dawn of surgery.

The anatomy of the female perineum can, for surgical purposes, be described as consisting of three layers, of which the superficial layer consists of the bulbocavernosi, on either side of the orifice of the vagina, the sphincter ani behind, and the transversus perinei on either side, lying on the triangular ligament. The bulbocavernosi and the sphincter ani close the orifices of the vaginal and anal canals.

The action of the transversus perinei must be exceedingly feeble, if any, in steadying the perineal center. It is present in thirty per cent only of adult females (Barker).

The second layer is the urogenital diaphragm, composed of three anatomic layers. The triangular ligament proper, which is homologous with the obturator membrane, is dense and strong and undoubtedly of the greatest value in resisting intra-abdominal pressure directed against it. Intimately connected with the superior surface of the triangular ligament, and corresponding to it in form, is the deep transversus perinei, and above this the superior layer of fascia, known as the deep layer of the triangular ligament.

Since it is practically impossible to separate these three anatomic layers, and for physiological reasons, I have described them together as one muscle, surgically speaking.

The third layer is the levator ani muscle, encased in its two layers of pelvic fascia, the rectovesical above and the anal fascia below. It forms the pelvic diaphragm, and in the perineal region rests on the urogenital diaphragm. This is the most important of all, since it is the muscular supporting layer. Its action is to draw forward, toward the symphysis, the rectum and vagina, to elevate the floor of the pelvis, and to support the pelvic viscera. It is united by its fellow of the opposite side, in front of the anal canal, by decussating fibers, some of which turn downward to blend with the deeper layer of the external sphincter, and some are inserted into the anterior wall of the anal canal. The next fibers, posteriorly, are inserted into the side of the anal canal, and the next set, posteriorly, terminate in the anococcygeal raphé, and the most posterior fibers are inserted into the sides of the coccyx. We are only concerned here with the anterior portion of the muscle.

The pubic portion is divided into puborectalis and pubococcygeus. This portion has its origin in an oblique line on the posterior surface of the body of the pubes. Its most internal fibers, originating at the lower portion of the line, are separated from their fellow of the opposite side by about one-half inch. These most internal fibers pass directly backward and slightly downward on either side, along the lateral wall of the vagina, and are inserted into the space between the rectum and the vagina, decussating with one another and intermingling with the fibers of the deeper layer of the superficial sphincter ani muscle, as well as other muscles that enter into the formation of the perineal center.

Popular text-books on anatomy, used in medical schools, have very little to say about this muscle in the female, except to mention that the inner portion of the muscle in front, or the puborectalis, surrounds the anal canal in a sling; but, as a general rule, they fail to illustrate the entire muscle as seen in a dissection from below. Cunningham's text-book on anatomy states that the puborectalis is the part which arises from the pubic bone, and is inserted in the central point of the perineum. Weisse, in his "Practical Anatomy," shows a dissection of the levator in the female representing a loop inserted into the space between the vagina and the anal canal. Porier et Charpy also show the same thing. Deaver's "Surgical Anatomy" shows a distinct muscle surrounding the posterior vaginal wall. Weldeyer describes the muscle in the female as being inserted into the space between the vagina and the anal canal.

My own dissection has invariably shown some of the internal fibers decussating in front of the anal canal, and I have found that in all books in which a drawing of a dissection of the muscle from below is given, they show these fibers which surround the vagina.

INJURY

As the child's head descends, and finally passes through the orifice of the vagina, it acts precisely like a mechanical dilator, and tends to rupture the soft parts at the point of greatest weakness. That is why the posterior vaginal wall is ruptured in the median line, from without inward, up to the posterior vaginal column. Above this point the tear never extends in the median line, but on one or both sides of the column, on account of the greater resistance of the column and the weakness of the tissues lateral to it. As we have just seen, the vaginal wall ruptures lateralward from weakness; so for the same reason the levator separates from its fellow of the opposite side, in the median line,

down to the rectal wall, and if further room is needed the fibers inserted into the junction of the rectum and the anal canal are stripped off anteriorally and laterally, and it is only in exceptional cases where the loop itself is torn at the sides of the vagina, although Harris seems to think this is the rule.

In certain cases we have complete tears involving the sphincter and the anterior wall of the anal canal, because of the firm attachment of these fibers of the levator ani into the anal canal.

The bursting of the perineal center, composed of the superficial muscles, allows the anus to drop backward toward the coccyx, since the sphincter ani, being torn from its attachment in front, retracts backward toward the coccyx, or, in other words, toward the bony attachment. When this occurs the anterior wall of the anal canal prolapses on account of lack of support.

The superficial perineal muscles are torn in various ways, and often the tear is not in the median line, though the skin tear, in the majority of cases, is median. We frequently have the tear extending outward through the bulbocavernosus, and transversus perinei of one side, into the ischiorectal fossa, leaving the perineal center intact. In other cases the tear extends down the median line, and the bulbocavernosus and sphincter are retracted in different directions, in the line of their fibers. In this latter instance the perineum will appear to be abnormally long, whereas in the former case, the sphincter ani being still suspended by the bulbocavernosus of the opposite side, the perineum will not be much elongated.

I would like to call attention to the great number of cases where the levator fibers, as well as the urogenital trigone, are torn down to the rectum, and yet the superficial perineal muscles are not torn. As a result of the separation of the levator down to the rectal wall, this becomes the weakest portion of the pelvic diaphragm, and, as Noble has shown, the

tendency is to become more and more stretched and relaxed by the intra-abdominal pressure, which is focussed at this point. In case there is an internal laceration of the levator fibers, without injury to the superficial structures, they will be found quite inefficient in holding up the pelvic structures, and we therefore have rectocele and cystocele occurring, notwithstanding that there seems, on superficial examination, to be a perfectly normal perineum. The diagnosis of internal separation is exceedingly easy if one is familiar with the topography of the levator, and inserts one finger in the rectum and one in the vagina, and palpates the intervening tissues.

PRINCIPLES

The general surgical principle that we should, in the repair of an injury, restore the parts to their normal relations, layer to layer, as far as is practicable, applies to the restoration of the perineum, and is precisely the same as that underlying operations for hernia; that is to say, the identification and suture of the different layers in their original positions. If this principle could be recognized so universally that no operation in the perineum were done without that same care in separation and identification of the different layers that we observe in doing hernia operations, the details of the operation proper would soon settle themselves. There should really be no greater number of methods of repairing the perineum than for suturing a laparotomy wound.

As to the incision, any incision will be proper that exposes the muscles in such a way as to permit accurate treatment of the deep structures. However, we do not believe in excising any considerable portion of the vaginal wall, for the reason that any apparent redundance of tissue will soon contract when the muscular and fascial supports are restored. Furthermore, excision of a portion of the vaginal wall un-

doubtedly diminishes the elasticity and distensibility of the vagina, and predisposes to rupture in subsequent labors. We should by all means avoid a rigid perineum, and aim to produce a normal, elastic one, which performs its functions through the action of its muscles. In order to carry out this idea it is necessary that we should use buried sutures, and restore the continuity of the levator fibers above the urogenital trigone, so that the muscle can have free play in its normal plane; for, if we include the urogenital trigone in suturing the levators, their action in drawing the anal and vaginal walls toward the symphysis will be interfered with, because the muscles are tied down at this point to the firm triangular ligament, thus substituting in the perineum a fixed point which does not exist normally.

There can be no doubt of our ability to successfully include the levator fibres, the urogenital trigone, and the superficial muscles in a single set of sutures, but it is unsurgical to include layers having different functions in a single set of sutures, for it is impossible to weld these three diverse layers together and expect to restore the physiologic functions of the different layers.

M. L. Harris, of Chicago (Jour. A. M. A., 1897), was the first surgeon to deliberately isolate the levator ani muscle, and subject it to surgical treatment. He recognized a lateral tear of these muscles as they course along the sides of the vagina, and also considered that there was an over-stretched condition which led to relaxation and backward dislocation of the rectum, and that this could be best corrected by an incision which exposed the muscle, permitting isolation of the muscle from its surrounding fascia and the excision of a portion, thus drawing forward the perineum and restoring its normal appearance. He did not suture the urogenital trigone. I do not think the Harris operation based on entirely correct principles.

It is my impression that the levator loop is very seldom torn along the side of the vagina. As above stated, the loop is torn down to the rectum, in the median line. I am certain that it is more correct in principle to restore this portion, even if somewhat exaggerated in size, than to excise a portion of the muscle in its continuity.

Noble of Atlanta, in 1903, described his operation for restoring the perineum. This operation consists of denudation, similar to Hegar's, as nearly as I can understand from his description. Through this incision he isolates and identifies the levator muscle in the lateral wall of the vagina, then opens the sheath of the muscle and brings it out for one-half or three-fourths of an inch. The suturing process is begun by sewing the vaginal wall and the rectovesical fascia, which lie on the concave surface of the levator ani muscle, by catgut stitches, up to the level of the levator loop. The levator muscles are then brought together by three catgut sutures. Next the triangular ligament and the bulbocavernosi are brought together by a layer of buried sutures, and finally the suture which was begun in the vagina is carried up to the posterior commissure and down on the skin surface to the end of the incision, just in front of the anus, thus completing the closure of the incision. Later he modified this operation by making a cut out through the inner edge of the muscle for three-fourths of an inch, and brought this portion together in front of the anal canal end to end. He was therefore the first operator to suture the levators together behind the posterior vaginal wall.

THE AUTHOR'S OPERATION

The technic of the operation, as I have performed it since 1902, without any important variations, is as follows:

The first step is the identification of the orifices of the vulvovaginal gland ducts on either side, just ex-

ternal to the remains of the hymen. A tenaculum forceps is now placed beneath these openings on either side so that neither incision nor sutures will encroach on these orifices, and to limit the incision so that it will not encroach on the vulva.

Lateral traction developes a prominent fold at the mucocutaneous junction, which is now split from side to side, going entirely through the vaginal wall. At the ends of the incision a short cut with the scissors is made, for one-half inch along the lateral walls of the vagina, in its long axis, in order to expose the muscles in case of internal injury. Blunt scissors are now pushed under the vaginal wall on either side for one inch, and the blades separated, thereby quickly raising the flap on either side, down to the rectal wall. The tip of the flap is now picked up with a T forceps, and raised by blunt dissection for not more than one-fourth of an inch. The lateral denudation extends up to the levator muscle on either side. It is not necessary to raise the flap in the middle line from the rectal wall for more than one-half inch, for, as we saw in studying the nature of the injury, in the great majority of cases there has already been some prolapsus of the wall of the anal canal, so that it is in effect one-half inch lower than it should be in front.

The next step is the identification of the levator on either side, which can be done by palpation. Then grasp the muscle with a forceps, and pull toward the median line. Still holding the muscle with the forceps, it should be completely loosened from any adhesions which may have formed between the inner edge of the muscle and the torn edge of the urogenital diaphragm This is the most important step in the operation, for, if we do not loosen the muscle so that it comes to the middle line easily and without tension, the perineum will be rigid and stiff, and the results of the operation unsatisfactory. It is unnecessary and

undesirable to separate the muscle from its sheath composed of rectovesical fascia.

The next step is the introduction of the deep sutures. The first suture is placed not more than three-fourths of an inch in front of the anterior wall of the anal canal. The second suture is placed one-half inch below this, or nearer the anal canal, and the two sutures are tied, thus restoring the pelvic diaphragm. There is a great tendency to put in too many sutures here, and thus render the vaginal canal too narrow at this point.

The next step is the identification and suture of the urogenital diaphragm with two sutures just superficial to the sutures placed through the levator ani loop. Identification of this structure is not difficult. It lies just superficial to the levator muscles, and if their margins can not be seen, they can at least be felt by picking up the tissues with ordinary dissecting forceps.

The next step is the attachment of the sphincter ani to its proper point in the perineum, which is done by two sutures.

The next suture embraces the posterior extremity of the bulbocavernosus on either side. They are carried immediately beneath the skin through the posterior end of the muscle. Two sutures are all that is necessary.

The flap now remains to be disposed of, and various methods may be adopted. One may trim off the edges of the flap laterally, and introduce a suture similar to Emmett's crown suture, putting in a lateral suture on either side of the vaginal wall. This is a very good method. Another is to commence in the deep layers of the skin on the patient's left side, and continue around through the mucous membrane of the flap and out through the opposite side, in the same way as an ordinary subcuticular skin suture. The advantage of the second method of treating the flap is that the deep layers of sutures are completely protected from any

chance of infection from the vaginal secretions. This flap suture should be of silkworm gut, in order to avoid too rapid absorption, which occurs quite frequently when catgut is used in the vaginal canal.

After the introduction of these sutures the skin wound will be seen to be not more than one-half inch long, as the operation is practically done in the vaginal canal; so a single suture in the skin surface is all that is necessary in most cases, and more than two are never necessary.

This operation, as carried out above, is practically without hemorrhage. The separation by blunt scissors is very rapid, and the whole operation, according to the above technic, can be carried out in all its details in from fifteen to twenty minutes. It is exceedingly easy, since there are no measurements to be taken and no estimates of distance to be made. One simply makes an incision, sees what is to be done, and at once proceeds to carry it out. Recognition of the muscle is also exceedingly easy, and the triangular ligament can be found readily enough by following the above directions.

REMARKS

The chief objection usually raised to any operation in the perineum in which buried sutures are used, is that there is danger of infection from buried sutures, and that, should infection occur, serious danger to the patient might arise and the results of the operation would be lost. This is unfounded. There is no part of the body that will better take care of buried sutures than the perineum. I have often used extra large twenty-day gut, simply as a test, and it has been taken care of without any trouble whatever. In about fifty operations which I have done personally I have not had a single infection.

In case there is complete laceration of the perineum, the injury to the anal canal may be managed accord-

ing to the method of E. C. Dudley. I have never had a failure with it, and can consistently recommend it, as it is exceedingly simple and easy. Or one may use the method of Noble. He dissects in between the anterior wall of the anal canal and the vaginal wall, separating them to such an extent that the portion of the anal canal which has been injured, is drawn completely without the anus and fastened onto the skin surface of the perineum after having been sutured. After a few days it retracts within the perineum, and causes no further trouble. He then finishes the operation in the regular way.

RESULTS

The results of this operation have been complete restoration of the function and form of the perineum. My first case was operated on three years ago, and I have had an opportunity very recently to examine the result, and I find the union absolutely good between the internal edges. Noble seems to think that eventually separation of these fibers must occur, and that the perineum will become thin. I do not think this is true, especially for the reason that in one case where too many sutures were placed, union has been absolutely firm, and some separation of the muscle by operation will be necessary before the size of the canal can be restored. This case occurred in the practice of a colleague of mine. I call attention to it in order that those who care to follow this method shall not put in too many sutures. As before said, there is a tendency to do this when the muscles are relaxed by an anesthetic, thus bringing about too great a narrowing of the vagina at this point.

DISCUSSION

Dr. A. W. Abbott, of Minneapolis, Minn.—When one voluntarily contracts the sphincter ani or any other of the muscles which make up the pelvic floor, all of the others contract at the same time. There is a synchronism in the contraction of these muscles. To try this, put the patient

on the back, have her contract the sphincter ani, or make an effort as if to stop the flow of urine, all the muscles will contract. If you put your finger in the vagina, you can determine what muscles have lost their function, either by stretching or laceration. In many instances a small incision in the mucosa can be made, and through this the muscles brought together. You will be astonished at the result obtained. In a great many other cases there is a general breaking down of the whole pelvic floor in the manner Dr. Hill has described, and in such a case the operation he has given us is a useful one. It is, in fact, practically what I have done since 1890, when I published this item about the co-ordination of the muscles of the perineum.

Dr. Henry T. Byford, of Chicago.—I would like to say a word or two in reference to this subject of restoration of the perineum. The surgeon who will hunt for the individual muscular bands and separate them is losing time and puttering. One can go to an extreme in this regard.

I endorse what Dr. Abbott has said, that if we introduce the finger into the vagina we can feel which muscle is gone. If there be a cicatrix only on one side, it indicates that the muscle is not extensively lacerated on the other side, and when you cut out that cicatrix you know where the ends of the muscles are. It is unnecessary, when you know where the muscles are, to dissect and draw out muscular fibres. Indeed, you rely more on the fascia for strength. The levator ani and its fascia retract towards its origin laterally, and toward the rectum on the other side of the tear, and you can easily draw up the separated tissues together in your stitch. You can get at the tissues without as much dissection as has been described by the essayist. When there is a complete laceration through the sphincter ani muscle, even though it does not involve the mucous membrane, you can feel the belly of the muscle, expose the ends easily, and draw them together.

In regard to priority, I would like to say that Dr. William H. Byford, in his book, published in 1888, gives a description of the different methods of determining which muscle is relaxed or gone. He also calls attention to the fact that the sutures must draw up the various muscles.

Dr. Hill (closing the discussion).—I have very little to add to what I have already said in my paper, except that I do not pretend that the operation I have described is entirely original with me. I think an anatomical demonstration should

be made in connection with all of these operations. I have been working out a plan I have had in mind for the purpose of restoring the lacerated perineum. I think the work of Dr. Byford is appreciated more than he thinks it is.

So far as tearing up the perineum by too much dissection is concerned, that is not true. We take up the levator ani, and loosen it from the scar tissue, which usually consists of torn edges, and then we can put the stitches in there. One does not need to put in more than half a dozen stitches. If one puts in too many sutures through the levator, when the patient comes out from under the influence of the anesthetic the perineum will be too tight. The best result must come from the consideration of both muscles and fascia. The muscles should be sutured separately, and not through the triangular ligament and levator ani, and the whole business tied down to a centrally fixed point which does not exist naturally.

DRAINAGE OF THE PELVIC CAVITY OF THE MALE

W. JEPSON, M. D.

SIOUX CITY, IOWA

It must be a fact well recognized by all surgeons of experience that the successful management of infective inflammations of the peritoneum, of any extent, resolves itself largely into one of affording exit in the most expeditious manner possible to the products of such inflammation, in order that the patient may be spared a death from toxemia. An adequate provision for the escape of such products becomes an immediate and most urgent demand where the inflammation has not become circumscribed, but is proceeding unhindered, by routes of least resistance, as determined by the anatomic characteristics of the part involved, to the ultimate involvement of a larger portion of the peritoneal areas. Upon the promptness with which such measures are instituted, and the thoroughness with which they meet the requirement, it would seem the outcome in this class of cases to a large extent must depend.

In order that such drainage may most efficiently meet the indications in any given case, reliance upon some routine plan of procedure must be discarded, and each case managed along lines indicated by the areas involved. This implies that the surgeon recognize, approximately, the source from which any given inflammation has its origin, and the division of the peritoneal cavity arising from the projection of the intra-abdominal viscera into the same, in which such products are primarily to be found, as well as others

into which extension is prone to occur, in order that drainage may be undertaken in a manner to prevent further extension. A desire that gravity might aid in the exit of the inflammatory products from such areas, has led to openings for the transmission of the drainage-tubes, etc., being placed in the most dependent part, as in the subrenal fossæ and in the pelvis of the female through the cul-de-sac of Douglas. That the favorable results obtained in drainage of the female pelvis might also be obtained in the male pelvis, in event of its being susceptible of being drained through the perineum, is a natural inference.

This led to our consideration two and one-half years ago of the problems involved in the drainage of the pelvic cavity of the male pelvis through the perineum. While drainage of the pelvis in the female, by an opening through the posterior vaginal fornix into Douglas' pouch, is one of the simplest of procedures, for the posterior uterine wall affords us an infallible guide, while no structures of importance are in danger of being damaged, the pelvic cavity of the male, by reason of the arrangement of its contained viscera, does not lend itself so readily to an opening into its most dependent part through the perineum. The intricate relation between the rectum and the bladder precludes the possibility of passing between these structures and opening the retrovesical pouch. This statement should probably be modified by saying that upon the cadaver it may be done by a somewhat careful dissection and without direct damage to either the bladder or bowel, or the important structures lying between them, namely, the ureters and vesiculæ seminales and ejaculatory ducts. But the length of time required—and in the class of cases where such drainage may be indicated this in an element of much import—as well as the danger which it has seemed to us that there existed of the possibility of pressure necrosis or obstruction of either ureter from the drainage tube

employed, has deterred us from the employment of this avenue. We have not viewed with favor a posterior route.

The pelvis may be most readily entered, without seeming risk of damage to the afore-mentioned important structures, by an opening made by the side of the prostate and the posterior external wall of the bladder, the point of emergence in the pelvic cavity being above and internal to the vas deferens, between it and the bladder just above the point where it leaves the pelvic wall to cross over to posterior external wall of the bladder. An opening into the pelvic cavity at this point will be in nearly as dependent a position as one made into the retrovesical pouch, and should consequently give nearly as good drainage, and it has the advantage of being rapidly made and seemingly without undue risks of damaging any structures of importance. The position of the vas is made out by following it down from the internal ring to the posterior wall of the bladder by palpation or locating the base of the prostate and passing an imaginary line from this to the internal ring, and the space above and internal to this should be within the area of safety barring the bladder. This is the route we have employed so far in the cases here reported. Its employment in practice with us has been as follows: In cases where the same is recognized as being necessary prior to the operation,—and this will generally be possible,—the patient is so placed on the table as to expedite the operation as much as possible, for it is believed that such patients do not tolerate prolonged anesthesia and operative procedures. The patient's lower abdomen and perineal region, having been prepared in the usual way, are left exposed, the rest of the body being adequately protected against heat loss, after which the legs are slipped off from the operating-table, hanging over its side, and thus giving a good exposure of the perineum. As in all of our cases but two, the

drainage has been instituted for diffuse peritonitis resulting from appendicitis, and the primary incision has been made at the site ordinarily employed, although carried down toward Poupart's ligament slightly farther than is usually done, in order that less difficulty may be experienced in carrying the index and middle fingers of the left hand down to the pelvic floor so as to here recognize the normal structures which are to be guarded against injury. With a scalpel in the right hand, the tuberosity of the ischium on the right side is sought for, and a stab wound is made through the perineal structures one-half inch internally to the same so as to avoid wounding the internal pudic artery. The knife is pushed forward so as to open through Colles' fascia, the anterior and posterior layers of the triangular ligament, and the levator ani muscle. After this the knife is withdrawn, and a pair of dressing forceps is introduced and pushed on through the peritoneum against the two fingers of the left hand so placed as to indicate the site where the perforation should take place. The forceps is then continued through the pelvic cavity, grasping and carrying down through the same the drainage tube intended to be employed. The size of drainage tube which we have generally employed is one-third inch in diameter with somewhat rigid walls in order to prevent its collapse through pressure from the surrounding tissues. We have always employed, in conjunction with this drainage, drainage through the primary opening, as well as of the subrenal pouches where the same have been involved. For the first 24 to 36 hours the cavity has been flushed every three or four hours with a pint or more of normal salt solution of a temperature of 105° F. In two cases continuous irrigation was employed in one for seven and in the other for twelve hours. We are not prepared to say that this is possessed of any special advantage, yet to us it has seemed so. In flushing the pelvic cavity,

only a minimum degree of pressure is employed, as, for example, that which would be represented by the reservoir being elevated about a foot above the pelvis, it being desired not to force such barriers against escape of liquid from the pelvis as may have resulted from adhesions of the intestines and omentum. Gravity as an aid to drainage has also been utilized by ample elevation of the head of the bed, as well as by permitting the patient to lie upon his right side. The drainage tubes are permitted to remain until the discharge has practically ceased, after which they are removed, and a silkworm-gut drain is introduced.

The total number of cases thus treated by us is nineteen, in all of which there existed diffuse pelvic peritonitis with accumulations of purulent fluid often elevating the distended bowel high into the abdomen, and in two cases ascending between the mesentery and descending colon and overflowing from the pelvis into the left subrenal fossa, which was also opened and drained. In all but five cases free pus existed in the space to the outer side of the ascending colon, which, in each instance, was drained through the ileocostal space. In one case the distended paretic bowel necessitated opening and the establishment of an artificial anus.

Three of the cases thus treated have died. One died after an illness of nearly five months, during which time death was threatened on three or four occasions by intestinal obstruction, while a number of abscesses followed in the abdominal wall. Death resulted from exhaustion incident to the prolonged suppuration. In the second fatal case, death took place ten days after the operation, and was due to toxemia. In this case there occurred the first and only untoward result from the procedure that has been observed by us, and I believe it to have been directly responsible for the unfavorable termination, for until its appearance the man was progressing most favorably to recovery, al-

though he was nearly moribund at the time of the operation. On the fifth day and until his death there appeared urine in the discharge. We remain in ignorance as to whether its source was from the ureter or the bladder, as no post-mortem examination was secured. We must, however, incline to the view that its source was the ureter rather than the bladder, as there was no pus in the urine voided per viam naturalem. That it was due to pressure necrosis, rather than to direct wounding of the part at the time of operation, seems most reasonable in view of the fact that it made its appearance so late after the operation. The third case died six hours after the operation.

The cases operated upon have varied in age from seven to fifty-two years. We have had no cases wherein there existed an enlargement of the prostate, which, if of marked degree, would render the procedure difficult, if not impossible.

We have noted what has seemed to us a marked tendency to the development of symptoms indicative of intestinal obstruction, following the operation anywhere from one week to two months. It appeared in six of the cases, and was interpreted by us as due to adhesions interfering with intestinal peristalis. In the management of this condition we have found that distention of the bowel with air at intervals, as indicated, has served us best in bringing about relief.

In conclusion, we would say that perineal drainage, as here outlined, has seemed to us to have given better results in this class of our cases than in cases previously treated without its employment. To what extent it has contributed, if at all, to the recovery of the cases in which we have used it, we are not in a position to say, as in none of our cases was this method relied upon alone to the exclusion of other drains, but was utilized in conjunction with anterior and ileocostal drainage. We well realize that the number of cases here reported is not sufficient upon which to base an opinion

that can be of much value, especially as there exists no means by which we can measure the varying degrees of gravity of these cases or terms in which the same can be expressed. The cases here reported represent all of the cases, except one, which have come under our care during that time, and in that case this method as an adjunct was overlooked.

A more extensive experience with the method may prove it to be useless and even possessed of dangers that we fail to realize at this time. We have presented to you the results of our experiences with this method, not for the purpose of influencing any of our hearers to an adoption of the plan, but, on the converse, to have the benefit of your critical discussion of its faults.

FOR DISCUSSION, SEE PAGE 258

TUBERCULAR PERITONITIS

T. E. POTTER, M. D.

ST. JOSEPH, MISSOURI

Over thirty years ago Spencer Wells opened the abdominal cavity to remove what he supposed was an ovarian cyst. The case proved to be a tubercular peritonitis. He drained off the fluid, sewed up the cavity, and was surprised to see his patient make an uninterrupted recovery.

In 1885 Henry O. Marcy, of Boston, supposing he had a case of diseased ovaries and tubes, opened the cavity to remove them, and finding a tubercular peritonitis he followed Wells' example, and was greatly astonished to get the happiest results.

About seventeen years ago I was called to examine a negro woman for enlargement of the abdomen. Every symptom indicated an ovarian cyst, and after a thorough examination I was positive as to my diagnosis. I prepared my patient, and operated upon her expecting to remove a cystic tumor weighing from twenty to twenty-five pounds. To my chagrin the moment the abdomen was opened, out came the intestines with a great quantity of fluid, and, instead of an ovarian cyst, the peritoneum, both visceral and parietal, met my view, literally covered with miliary tubercles. I replaced the bowels, sponged out all the fluid that did not escape, and sewed up the abdomen. The woman made a rapid recovery, and was living and well five years ago, when I lost sight of her.

I will ask the question here, Who in this Association has not had surprises of this kind?

The most common age for tubercular peritonitis is from twenty to forty years, yet it does occur in

children as young as two, in the form of tabes mesenterica, and in persons at as advanced an age as seventy.

Sex seems to be an important factor. While men and women are both afflicted with this disease the preponderance is in favor of the latter. Wm. J. Mayo says four females have it to one male. Osler says two females are afflicted to one male. In my work the proportion is ten women to one man.

Etiology.—The source of infection of the peritoneum in tuberculous peritonitis has created a great deal of discussion, and many theories are advanced as to the scientific cause, or as to how the bacilli tuberculosis get into this cavity. It has been claimed that in females it is often through the fallopian tubes by ascension; in both sexes through the appendix, rupture of a mesenteric gland thereby causing the peritoneum to become generally infected, through the lymphatics, through the intestinal walls, and through the blood. I believe that the last theory is correct, and to my mind it is fully proved.

The majority of my cases were not complicated with tuberculosis of any other organ or region of the body. In some the pathology was so extensive as to give evidence that the trouble had existed for a long time; in others the patients had a bright and healthy appearance, and were first induced to seek medical advice because of the accumulation of fluid in the abdomen. This proves, to my mind, that these germs may and often do lie latent in the tissues of the body for an indefinite period, waiting in a quiescent state for a favorable opportunity to arouse them to activity. This opportunity comes when the tissues are weakened from any cause, let it be traumatic, disease, or physiologic, and lack the power to resist the influence of these germs. This no doubt accounts for the fact that we so often have tubercular peritonitis following pregnancy, either after regular confinements or miscar-

riages; or find it in connection with diseased tubes, appendix, or diseased gall-bladder.

I agree with some others that tuberculosis is not very dangerous, unless it becomes associated with other virulent micro-organisms, as pyogenic microbes, thereby producing mixed infection; and that the formation of enzymes encourages the destruction of tissue, as well as the formation of toxins which bring about destructive septic intoxication. It is generally understood that "no saprophytic principles belong to tubercular bacteria," *per se,* and when they destroy their host they destroy themselves. We must remember that these bacteria are amotile, and do not possess flagella.

First: As to infection through the fallopian tubes. The bacilli tuberculosis are not likely to ascend by any movement of their own through the vulva, vagina, uterus, and tubes to the peritoneum, for every law of nature is against such action. The vulva, vagina, and uterus are seldom attacked by tuberculosis, and when the uterus is so attacked it occurs in girls before puberty and in elderly women who have reached the menopause. If the uterus were the seat of tubercular disease, then we might expect the tubes to become affected by continuity or contiguity.

Second: The appendix and cecum are often invaded, or are the seat of numerous tubercles. We can easily account for this, as they are frequently the seat of inflammatory action and pathological changes which make the tissues in these regions, as well as the delicate tissues of the tubes, incapable of resisting the germs.

Third: As to the lacteals and mesenteric glands. It is possible that the rupture of a gland may distribute the infection to the peritoneum. When the germs enter the lymph spaces, as they do in the duodenal region, they are usually destroyed.

Fourth: As to the inoculation of the peritoneum

through the intestinal wall. When there is tubercular ulceration of the glands in the mucous membrane of the intestines, the infection can reach the peritoneum only by extension by contiguity; and we doubt very much whether this ever takes place unless there is a perforation.

Fifth: The most reasonable theory is that these micro-organisms are carried to the disabled parts by the blood. This may be by the leukocytes themselves, either by positive chemotaxis or the germs accompanying them in the stream. We know these organisms are the scavengers of the body, and in their efforts to remove noxious agents they may carry or draw more to the parts than can be managed. This infection must reach these parts in some such way as this, and the same law applies to the meninges of the brain, where there is no other way for infection to take place.

Before discussing the symptoms a classification should be given, as the different forms present different symptoms. The one given by Frederick Treves in the Annals of Surgery in the year 1894 will suffice. It is as follows: first, ascitic form; second, fibrinous form; third, ulcerous form.

The symptoms are not always clear; in many instances they are very obscure. The onset may be sudden,—at first only a slight uneasiness in the abdomen associated with gas in the bowels. If the trouble is in the neighborhood of the fallopian tubes there is tenderness in this region, and at the vault of the vagina. This tenderness is greatly increased on pressure. Associated with this may be some enlargements, varying in size, that cause the surgeon to suspect a tumor. At a subsequent examination these enlargements may have disappeared. When the seat of origin is at the appendix or cecum the tenderness, unless the inflammation becomes quite acute, is slight, but annoying. At times the cecum will be so inflated with gas as to cause an enlargement. The uneasiness and pain will be mod-

erate, but the patient will never be free from it, except when he is quiet, and at times not then. The patient becomes nervous and begins to feel tired and worn out after the least exertion. Often the abdomen begins to enlarge before a physician is consulted. There will be some disturbance of digestion with usually very obstinate constipation; pain on micturition, often after the bladder is evacuated; and the face will indicate distress and tubercular troubles as the disease advances. In some cases emaciation will begin and progress as the fluid increases in the abdomen.

As the walls of the abdomen grow thin, not only will nodes be detected upon palpation, but the coils of the intestines can be seen through the walls. These nodes are formed principally in the omentum as the disease increases.

In some instances the fluid seems to disappear, and the enlargement goes down only to return in a few days.

Associated with the bowel trouble there will be chills, followed by fever, resembling attacks of malaria. Perhaps the only way to determine positively that they are not malaria will be to have the blood carefully examined, which will show absence of the plasmodium. The morning temperature may be subnormal.

As the disease advances a blood count should be made which will show a marked increase in leukocytes. This is not a very definite symptom, as it occurs with many other troubles. There is always associated with tubercular peritonitis a progressive cachexia.

It is stated by Kelley that the discovery of tubercular bacilli in the vaginal and uterine secretions points to this malady. He also dwells upon the sudden onset of the disease after pregnancy, whether it has reached full term or there has been a miscarriage.

It is well, when the fluid is not encapsuled and is loose in the abdomen, to look into the condition of

the kidneys, making both a thorough chemical and microscopical examination of urine to see if there is anything like cirrhosis of the liver or heart lesion. If these are not present the evidence is strongly in favor of a tubercular peritonitis. When the tubercular mass concentrates around the cecum and appendix a tumor is often formed, and this may be mistaken for an appendicitis, but when this is the case these structures are usually involved.

If the fluid is encapsuled there may exist only a small amount, say, a teacupful, and again there may be several gallons. It may be difficult to differentiate between some of these cysts and an ovarian cyst. Occasionally a violent peritonitis will set in which may be only local, yet it may become general, due to the rupture of a tubercular ulcer.

These encapsuled conditions sometimes stand out like pronounced ovarian cysts; and by percussion, when the patient lies on her back, there will be resonance, owing to the intestines, in some instances, rising to the top of the fluid. This will not always be the case, as adhesions may prevent it. The spleen is sometimes enlarged, also the uterus. If the tuberculosis exists in bones, joints, lungs, glands, or other structures, it will take only a few of the symptoms named to cause us to suspect tubercular peritonitis.

The prognosis depends entirely upon the nature of the disease. When confined to the miliary or ascitic variety, and other organs are not involved, we look upon the prognosis as favorable, if the disease is properly treated.

The prognosis of the fibrinous variety is not considered favorable; still much good can be accomplished by tearing up the adhesions.

The ulcerous form, when it is extensive, is looked upon as very grave.

Treatment.—Some of these cases recover spon-

taneously with favorable surroundings, good nourishing food, and the administration of tonics and antiseptics, such as salol, etc. We do not think, though, that this course can be relied upon.

Surgery has proven itself to be of such value that we feel this method of treatment should be adopted, even if the diagnosis is not perfectly clear. To open the abdomen, allow the admission of air and light, and then sew it up again, even if tuberculosis does not exist, is no very grave matter, and will benefit the patient by enabling the surgeon to search for any and all kinds of disease that may exist, thereby enabling him to proceed with the treatment intelligently. The value of surgical interference in tubercular peritonitis is incalculable. From 66 2-3 per cent to 75 per cent are restored to health. I think a much larger per cent get up from the operation, and are greatly benefited, even if they do not all completely recover.

All will admit that to remove the fluid by draining it off is valuable, for this eliminates a toxic fluid that cannot help doing great harm if allowed to remain.

The cure,—how it is effected,—is the great question before us. That patients are temporarily cured, and re-inoculation takes place, we do not question. Surgeons claim that, as a rule, if the disease does not return for five years the patient is cured. I cannot help feeling that this is an unfair conclusion. If we should take this position concerning many other diseases our percentage of cures would be small in a great many of them.

We may have to operate three or four times before our patient is entirely well. When the abdomen is opened, is it light, air, or the introduction into the abdominal cavity of saprophytes, or a physiologic change that benefits patients so greatly, or is it the application of antiseptics to these tubercles? Marcy opens the abdomen, sponges it out well, then applies

to the tubercular area a gauze saturated with a solution of bichlorid, 1 to 1000, then sponges out the cavity. He thinks this procedure a good one, but we find patients do just as well without it. Washing out the abdominal cavity with the simple normal salt solution may do good in some cases; in others it may do harm. Some recommend the application of iodoform emulsion, while others do nothing but open, drain, and sponge out the cavity, and they get equally as good results. Men like Kelley claim that they attain as good results without drainage, after sewing up the abdomen, as many of us do with drainage. He condemns drainage in these cases, for fear of a permanent fistula or hernia.

To the point: I believe the benefits come from a physiological cause. To open the abdomen and clean out all the fluid encourages dilatation of the capillaries, and allows numerous healthy leukocytes to enter the area of combat, and by their presence they are able to repair the pathology.

Some may say I am inconsistent, that I have stated above that leukocytes were the carriers to the weak points, and as scavengers deposit the bacilli or draw them, and from them the trouble began. I have so stated, but you must not forget the writings of Job, when in his affliction he said: "The Lord hath given and the Lord hath taken away; blessed be the name of the Lord."

So we see this truth exemplified in this, and to my mind it is clearly proven in the quotation.

Sajous, in treating of this subject in the Annual and Analytical Cyclopedia of Practical Medicine, vol. 5, page 434, says:

"Case of a girl, aged 20, with tuberculous peritonitis, upon whom laparotomy has been personally performed four times in six months, with the result that for the last four and a half months there has been

no sign of recurrence, and the general health has been highly satisfactory. After each operation temporary relief was noticed. Careful microscopical examination of the affected peritoneum was made each time, and as a result of this it is affirmed that cure takes place in these cases by leucocytic invasion, organization of fresh connective tissue, vascular new formation, and substitution of tuberculous by inflammatory neoformations. Washing out the peritoneal cavity does not act in virtue of any particular antiseptic or antituberculous property of the solution, but mechanically, by setting up a certain amount of inflammation, and the washing assists this, partly through the disturbance, which the sponging out of the fluid necessitates."

FOR DISCUSSION, SEE PAGE 258

TREATMENT OF ACUTE DIFFUSE SEPTIC PERITONITIS

DONALD MACRAE, JR., M. D.

COUNCIL BLUFFS, IOWA

This paper will be limited to the consideration of the treatment of acute general or diffuse septic peritonitis. Under this head I might also include sudden septic extravasations into the peritoneal cavity, which are diagnosed and attacked before the peritoneum is macroscopically or symptomatically involved, but which, from the amount and character of the septic material liberated, would probably insure a violent general infection of the serous membrane within a few hours.

The object of this paper is to place the management of peritonitis on a practical and more definite basis, by attempting to excite a thorough discussion before this society of eminent authorities.

While I realize the fact that peritonitis is in reality a symptom, yet, unlike most symptoms elsewhere, the removal of the etiological factor in the production of the general infection, will not cure the condition. Practically, therefore, general infection of the peritoneum must be considered as a disease, the intensity of which depends upon the virulency, and not wholly upon the amount of the septic material liberated.

We are taught by experimenters that the normal peritoneum can dispose of large numbers of pyogenic micro-organisms without producing peritonitis. This is very pleasant to know, and probably accounts for some very brilliant results in abdominal surgery, where sins of commission and omission were pronounced at

the time of operation, but I am equally sure that many useful lives have been sacrificed upon the altar of this teaching. Injections, by means of a needle, of a small numbers of pyogenetic organisms within the normal peritoneum of a dog, is one thing, and the liberating of the same number of similar organisms during the manipulations of a severe abdominal operation under anesthesia in the human, is another. You must agree with me that, while no particular pathology exists in the peritoneum after an aseptic operation, yet you must admit that the membrane is not physiologically normal (if I may be allowed the expression), for several hours at least, in many cases. Therefore, I conclude that the liberation of a few pus-producing germs within the peritoneum at the time of a moderately severe operation, may prove to be a most serious calamity.

At this point I wish to ask what treatment should be pursued in a case of ruptured duodenal ulcer, appendix, or septic gall-bladder with accompanying symptoms of diffuse peritonitis? In my fifteen years of moderate surgical experience, I have tried the whole almanac. First, I flushed with gallons of hot water, and then inserted one glass tube over the seat of the primary pathology, and one in each lumbar region, and put the patient to bed. Practically all of these cases died. A little later Muscatello's (Virchow's Archiv., 1895) investigations on the histology of the diaphragmatic peritoneum, and the mechanism of absorption of substances from the peritoneal cavity, proved conclusively the existence of an intraperitoneal current which carried fluids and small particles toward the diaphragm regardless of the animal's posture. "The rate of transmission of the matter from the peritoneal cavity to its ultimate repository, the lymph glands, could, however, be retarded by the influence of gravity." "In those dogs which were suspended with heads down, carmine bodies appeared in the retro-

sternal and thoracic lymph glands in from five to seven minutes, while in animals in which the posture was reversed, it was five to five and one-half hours before they could be recovered from these glands." This led J. G. Clark and Howard Kelly (Kelly Op. Gyn.) to elevate the foot of the bed for 18 to 24 hours in all serious contamination of the peritoneum. I tried this with disastrous results to my patients. About this time J. M. T. Finney introduced the method of "disembowling the patient" for the treatment of general diffuse septic peritonitis, and advised us to systematically wipe out the peritoneal cavity with hot salt gauze. Finney reported five recoveries. At last, I thought, the terror of peritonitis could no longer exist. I attempted several operations by the Finney method, and a few cases lived until the next day.

Up to the year 1900, after attempting every method advocated for the treatment of peritonitis, I became discouraged, and had about concluded to let nature take her course, instead of resorting to the knife, when I came upon the paper of Dr. Fowler of New York, who strongly advocated the "sitting up" position, and reported nine consecutive recoveries.

I tried this method, with drainage over the seat of the primary pathology, with flushing of the cavity with normal salt solution, and was gratified at the results. Not that my recoveries were so eminently successful as the reported cases of Fowler and later of J. B. Murphy, but that *some* of my cases recovered.

In 1902 Van Buren Knott, of Sioux City, emphasized the necessity of the "sitting up" position, and in addition advocated drainage of the most dependent portion of the general cavity, namely, the bottom of the pelvis, by means of large tubes inserted above the symphysis pubis. Dr. Knott inserts a small gauze wick through the tube, and thoroughly flushes the cavity throughout with hot normal salt solution. At

first I was not impressed by the teaching of my friend Knott. I was afraid of the large one and one-half inch tube. I had been taught that even small tubes were dangerous irritants and were often the means of producing a general infection of the peritoneum, obstruction of bowels, perforations, etc. Again, I was uncertain of the mechanism of the question of drainage of the general cavity, and doubted much the propriety of draining all cases at this point.

On several occasions after this, Dr. Knott informed me of his continued success by this method. Therefore, eighteen months ago, or about the middle of the year 1903, I first employed this plan of treatment, but I did not flush the cavity, neither was the gauze wick inserted through the tube. The flushing was discarded on account of the collapsed and pulseless condition of the patient. The history of this case was as follows: J. S., boy aged 18, was brought to the Woman's Christian Association Hospital, with diagnosis of strangulated inguinal hernia of four days duration. The patient was in collapse. Upon examination a large tumor was found in the right scrotum; the belly was much distended and rigid; the temperature, pulse, and facial appearance presented a picture of general diffuse peritonitis. The scrotum was opened, and, to my surprise, I found only a sac of pus, and as the latter continued to appear at the internal ring, I opened the belly in the middle line, and found the entire peritoneal cavity involved. Making straight for the appendix, I was not surprised to find it the seat of the trouble. Only a stump of the appendix remained, which was simply tied off with catgut. The condition of the patient would not admit of thorough flushing, so I hurriedly removed most of the fluid and pus with salt gauze, placed a tube through a stab wound over the appendix, and then inserted an inch and a half India-rubber tube above the symphysis pubis to the lowest part of the pelvis. The patient was placed in

a sitting posture, and carried to bed, and kept in this position. A quart of normal salt was thrown under the skin, stimulants were administered, etc. I then informed the mother of the boy that her son would not live until morning. Much to my surprise the patient recovered. Since this case I have operated upon nine other cases of acute diffuse peritonitis with but one death, and I have operated upon many other cases in which the peritoneum was more or less generally infected, employing in each case the same method of treatment with most gratifying results. Of the nine other acute general infections, seven originated in the appendix, one in the duodenum (ruptured ulcer), and one was a post-operative case of pyosalpingitis in which no drain was employed. Since I became acquainted with the Knott method I have not had an opportunity to test it on general peritoneal infections from any other source, but I am satisfied the results would have been most encouraging.

Notwithstanding the recent original and masterly article of Dr. John L. Yates, which appeared in "Surgery, Gynecology, and Obstetrics," the new Chicago medical journal, in which, after an exhaustive experimental study ("An Experiment Study of the Local Effects of Peritoneal Drainage," December 1905) of the local effects of peritoneal drainage, I am of the opinion that his conclusions will do great harm. I take the liberty to quote a few of his conclusions:

1. "Drainage of the general peritoneal cavity is physically and physiologically impossible."

2. "The relative encapsulation of the drain is immediate."

3. "The absolute encapsulation occurs early (less than six hours in dogs), and can be retarded, but not prevented."

16. "Peritonitis, if not severe, possibly aids in the rapidity of the encapsulation of the drain."

17. "A drain in the presence of infection is deleterious to peritoneal resistance, and should only be introduced to exclude more malign influences."

18. "Postural methods, unless destined to facilitate encapsulation, are both futile and harmful."

19. "Peritoneal drainage must be local, and unless there is something to be gained by rendering an area extraperitoneal, or by making from such an area a safe path of least resistance leading outside the body, there is, aside from hemostasis, no justification for its use."

Had I read this exhaustive article of Dr. Yates, with all his scientific experiments and deductions, prior to 1903, I fear I would not have had the nerve to attempt either the Fowler or Knott recommendations.

My conclusions are as follows:

1. The so-called Fowler position should be established in all suspected cases of peritoneal infection, local or general.

2. The primary cause of the infection should be removed, if possible.

3. The cavity to be thoroughly wiped out with hot normal salt gauze.

4. A large soft-rubber tube one inch in diameter should be inserted immediately above the symphysis pubis to the bottom of the pelvic cavity (Knott).

5. The tube to be sucked dry as often as necessary.

6. A one-half inch tube to be inserted over seat of primary pathology through a stab wound in the belly.

7. No gauze to be used, except in case of hemorrhage or to render a part extraperitoneal, and then to be covered with rubber tissue.

8. Flushing of the cavity with fluid is unnecessary and may cause harm.

My reasons for advocating these conclusions are based on my results in operated cases of general acute peritonitis on the human animal.

FOR DISCUSSION, SEE PAGE 258

CHYLOUS CYSTS OF THE MESENTERY

MILES F. PORTER, M. D.

FORT WAYNE, INDIANA

The basis of this paper consists of a study of the literature on the subject, including the reports of nineteen cases which I have been able to collect, together with one case which occurred in my own practice of which the following is the report:

J. W., aged 22, male. Referred by Dr. A. H. Mouser, of Latty, Ohio. Patient's father was killed by lightning, mother living and well. Both maternal grandparents died of pulmonary tuberculosis. Commencing when he was ten years of age the patient had numerous attacks of pain in the right lower quadrant of the abdomen. Two years prior to my visit he had a severe attack which lasted for three months. After this attack he remained well for some months, when he had a milder attack, which lasted a week. This last attack was in July, 1904. In February, 1905, the pain came again and continued intermittently until May 3d of the same year, when I saw him with typical symptoms of obstruction of the bowel. There was a tumor in the right iliac region. Tenderness was not marked and was rather diffuse. The abdomen was markedly tympanitic, and there was no localized muscular rigidity. A diagnosis of appendicitis had been made by Dr. Mouser in which I concurred.

On opening the abdomen through the right rectus a group of chylous cysts was found, together with a volvulus involving that portion of the ileum attached to the mesentery in which cysts were found. The

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The plates illustrating this paper were loaned through the courtesy of the Annals of Surgery.

number of cysts of itself precluded treatment by drainage. Their enucleation could not be accomplished without serious danger to the integrity of the gut; besides, the vitality of the gut had already been nearly, if not quite, exhausted by the twist. Hence, excision of the bowel, together with the mesentery containing the cysts, was done, and an end-to-end anastomosis made with the aid of a Murphy button. The abdomen was closed without drainage. The patient did well until the night of the sixth day when he commenced to complain of abdominal pain, and died within twelve hours. A post-mortem examination showed leakage at the mesenteric attachment at the point of anastomosis. The union was perfect throughout the rest of the circumference of the gut. There were no signs of peritonitis. The button was loose in the gut save for a minute shred of tissue, which still held. Figures 1 and 2 are drawings made from the specimen.

LITERATURE

The literature on the subject, so far as the text-books are concerned, is very meager. Sutton[1] devotes ten lines to the subject of chyle cysts, and Douglas[2] the same space. Greig Smith[3] devotes less than four pages to the entire subject of mesenteric cysts including their treatment, while Maylard[4] does not mention the subject. In Treve's "System of Surgery" and in the "International Text-book of Surgery" will be found the best text-book articles I know of on the subject, but both are very short and imperfect. The current literature contains comparatively few articles upon chylous cysts. Among those which I have found I will mention Bramann's[5], Fetherston's[6] report of a case with the discussion thereon, Mendes de Leon's,[7] and Fasch's,[8] with the discussion.

Moynihan[9] in his excellent paper on "Mesenteric Cysts" devotes three and a half pages to chylous cysts. Dowd[10] in his paper bearing the same title gives less

than two pages to chylous cysts. Carson[11] of St. Louis read a paper upon "Chylous Cysts of the Mesentery" before the American Medical Association in 1889. Unjenim and Petroff[12] wrote an excellent paper on the subject, and collected all the cases they could find in the international literature.

History.—The history of the development of this subject was until recently inextricably bound with the history of mesenteric cysts in general, and even now this is true in a great degree though in later years, as our knowledge has grown, a separate study of chy-

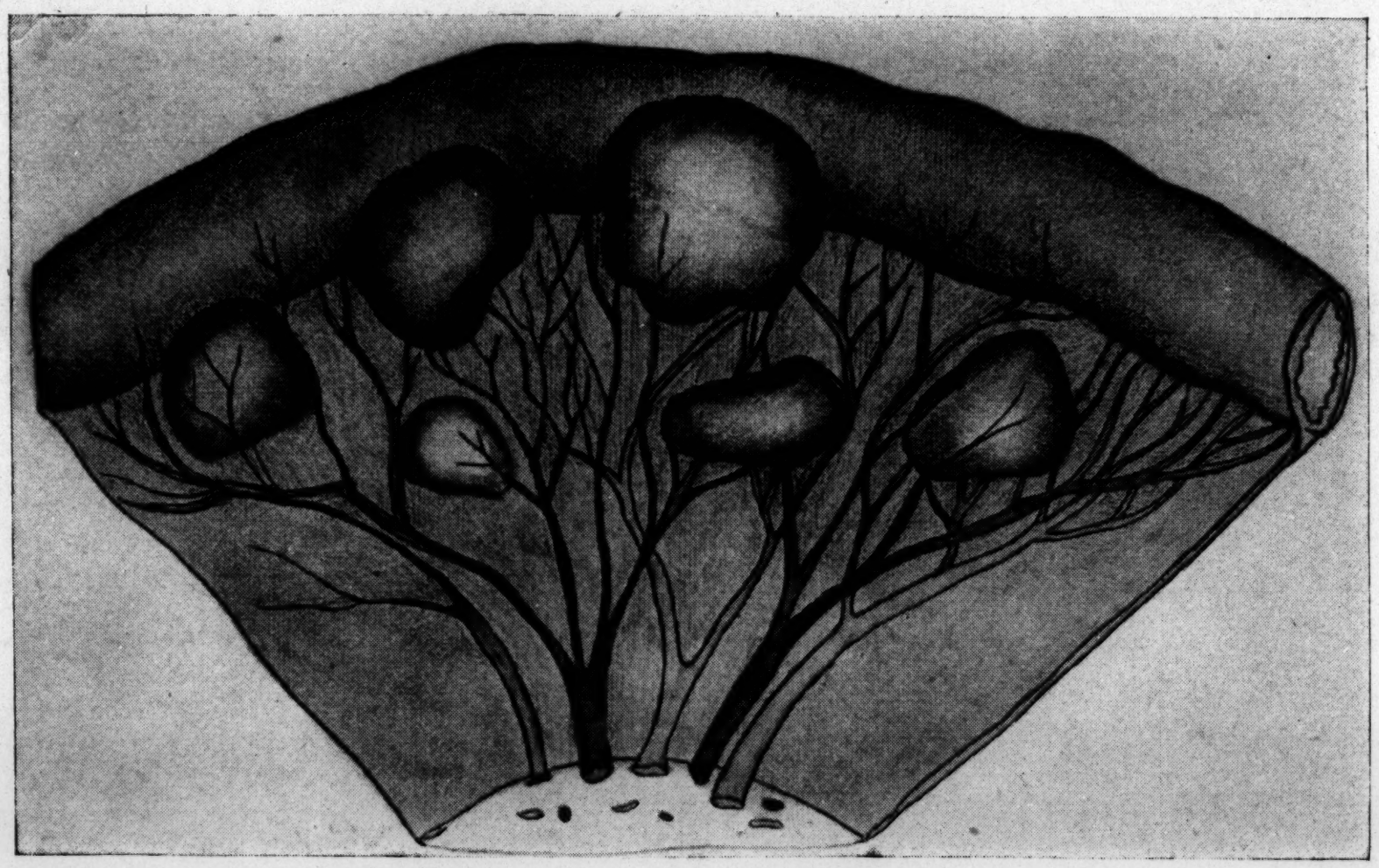


Fig. 1. Author's case. Showing bowel with mesentery and cysts excised. Multiple.

lous cysts has been made by a few writers. Cysts of the mesentery were first classified by Portal in 1803. Dowd[10] in his article gives references to 145 cases of cysts of the mesentery of the various kinds. Unjenim and Petroff[12] in 1889 reported the first case of chylous cyst in Russian literature and collected nine other cases from international literature. When Bramann's case was operated upon (1886) no other case was re-

corded which had been treated surgically. Kilian[13] reported, in 1886, a "lymph-cyst" treated surgically. This was two months later than the Bramann case was operated, but before its publication. Carson's case was the first one reported in America, so far as I know, and it was the largest that had been reported at that time in any country. Rasch was of the opinion that his was the first published case of chylous cyst occurring in a woman, but in this he is mistaken, for Kuester and Werth each operated upon a woman in 1882, while the Russian case above referred to antedated that of Rasch a year, and Pitman's[14] case was reported in 1857.

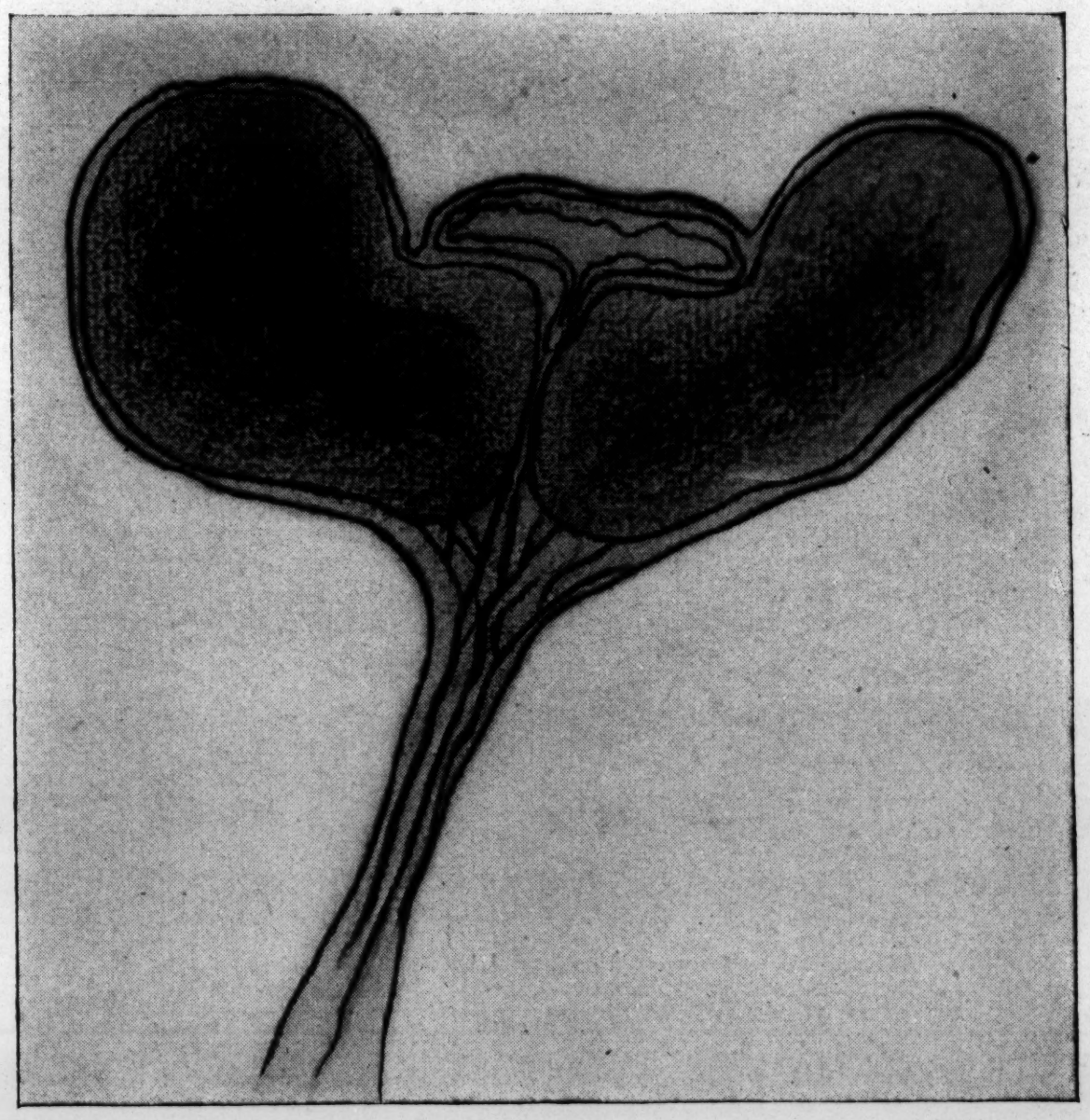


Fig. 2. Drawn from transverse section through specimen from author's case. Showing flattening and compression of bowel by cyst.

Frequency.—Chylous cysts of the mesentery belong to the surgical rarities. When Carson wrote his paper he was able to collect eleven cases, and the writer has

been able to find but nine more, including his own, making in all twenty cases. One of these (Eppinger's) is perhaps doubtful, as he reported it as a dermoid cyst, but Werth considered it a chylous cyst.

Concerning the relative frequency of serous and



Fig. 3.

chylous cysts there is considerable difference of opinion among writers. Hahn[15] says that serous cysts are the more common, while Smith[16] and Dowd[10] say that chylous cysts are the more common. In my own re-

search in current literature I have found twenty-nine cases of serous cysts and twenty cases of chylous cysts, and I am therefore forced to side with those who think the serous cysts more common.

Pathology and Etiology.—Dowd[10], in speaking of the origin of chylous cysts, says: "Taking these cysts together it seems pretty well established that the chylous cysts are preformed cysts, situated in such close relation to the lacteals that chyle has been effused into them and that they are really of embryonic origin, in structure similar to ovarian and parovarian cysts."

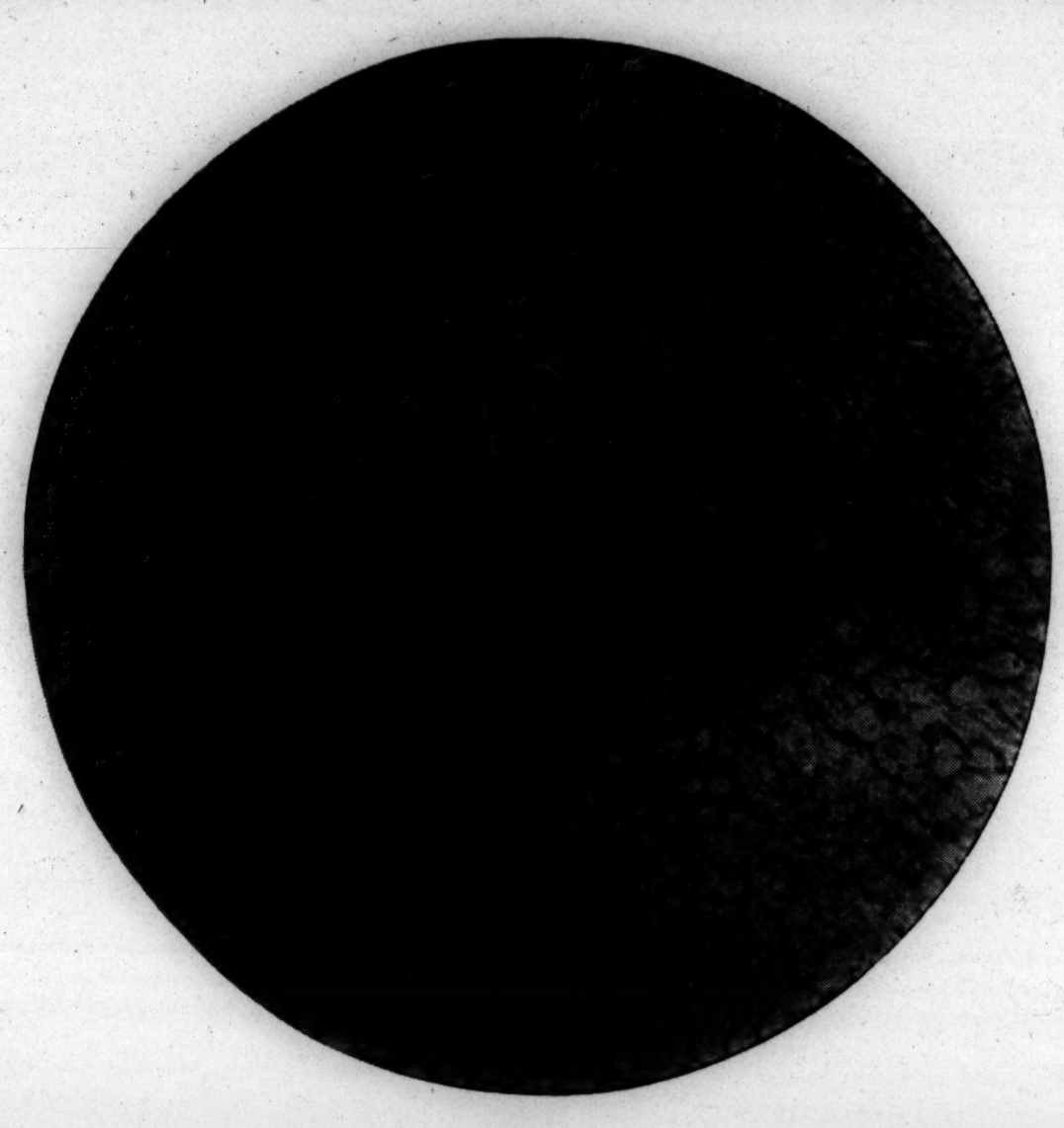


Fig. 4.

The microscopic examination of the specimen removed from Rasch's patient seemed to show in this case that the tumor originated from the rupture of a chyle vessel probably produced by trauma, and in the discussion of this paper Doran agreed entirely with this view. Upon similar evidence it was determined that Fetherston's[6] case originated in a lymph gland. The

specimen from Bramann's[5] case presented no endothelium nor epithelium on the inner surface of the cyst wall, and originated most probably, as did Fasch's, from the rupture of a lymph vessel. According to Carson[11] eight of the cases collected by him were due to degeneration of lymph glands, and three to dilatation of lymphatics. Von Blum suggests as a common origin typhoid or tubercular degeneration of mesenteric glands.

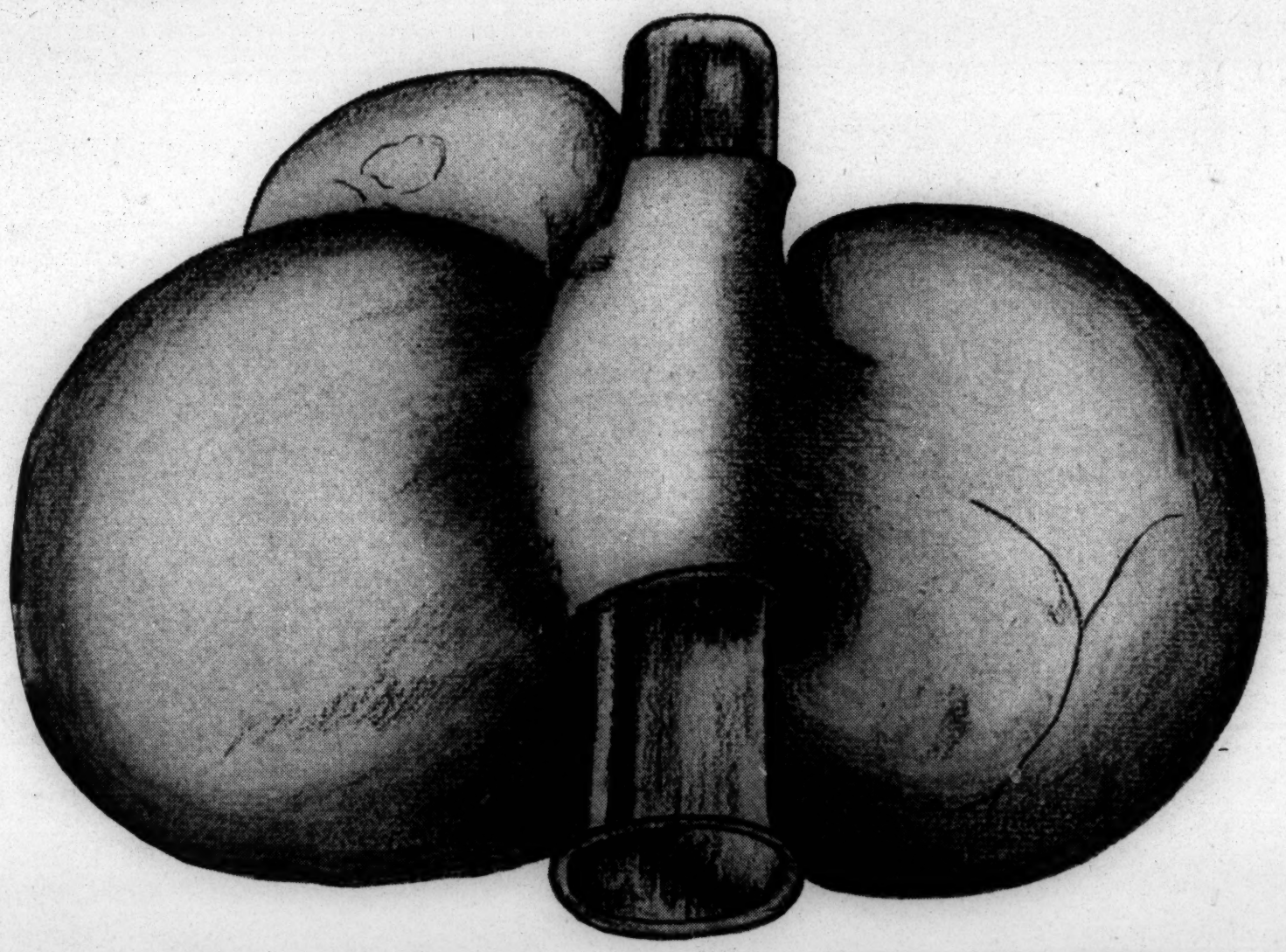


Fig. 5. From Moynihan. Annals of Surgery. Vol. XXIV. Tube passes through gut.

That a few cases of chylous cysts have been reported which had their origin in the dilatation of the receptaculum chyli or large retroperitoneal lymphatics there can be no doubt, although cysts having this origin are not likely to occupy the mesentery, but are usually in close contact with the spine as in the case reported by Scharlemmer.[17] In my own case there were several distinct and relatively widely separated cysts. Chemical and microscopical examination of the contents of the cysts proved it to be chyle.

The report of the microscopical examination of the specimen made by Dr. J. B. McEvoy is as as follows:

The gross specimen submitted for examination consisted of a portion of intestine about four and one-half inches long with attached mesentery. In the mesen-

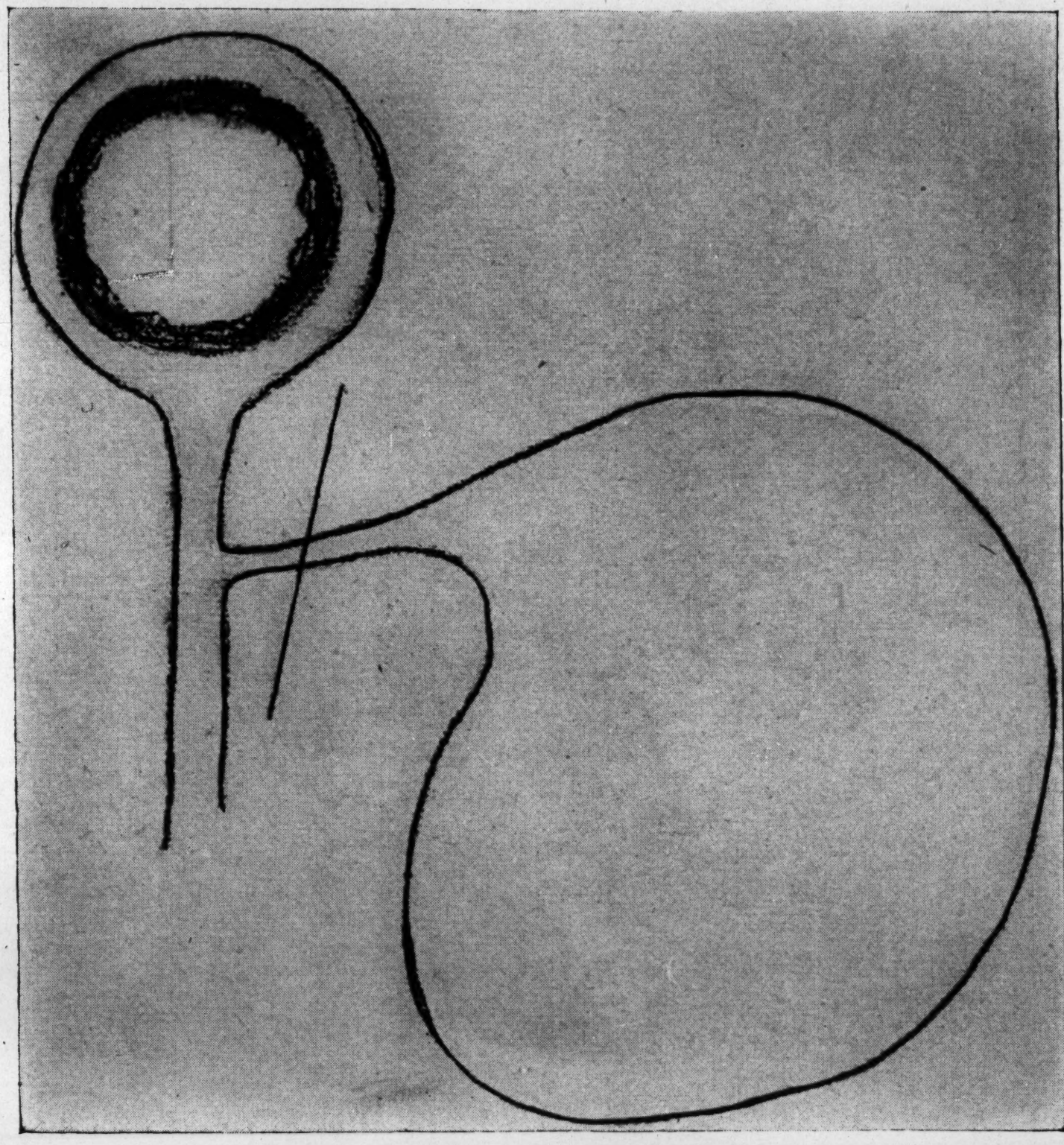


Fig. 6. From Moynihan. Showing cyst with pedicle. Gut was strangulated from traction on pedicle. Unilocular.

tery there were several cysts from which the fluid had been evacuated.

The specimen illustrated in plate 3 was taken from the wall of a large cyst next to the bowel. A cube was removed from the floor of this cyst next to the

intestine, and it included a portion of the bowel wall which was continuous with base of the cyst. Microscopical examination of this cube shows a great increase in the lymphatic tissue of the bowel wall. The bowel mucosa still shows the outline of the secreting glands, which are normal to the part, but the epithelial

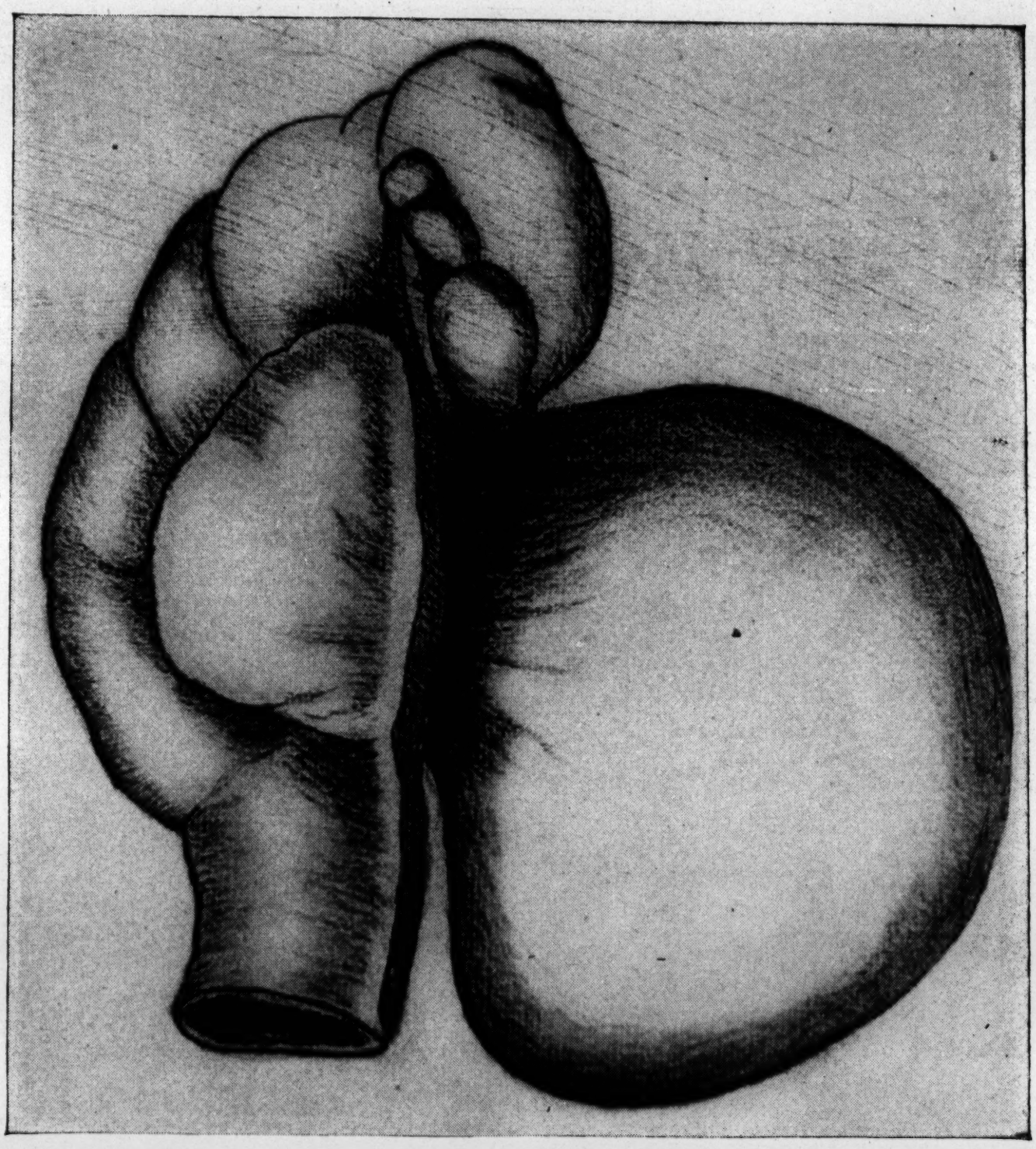


Fig. 7. From Moynihan, Multilocular cyst.

lining has been destroyed and the lumen filled with lymph cells. These lymph cells also distend the periglandular structure. In some places we find a layer of lymph cells covering the mucosa. Beneath the mucosa, infiltrating the muscular layer of the bowel and

extending upwards to form the floor of the cyst, was a mass of lymphatic tissue consisting of cells in all stages of ameboid movement.

Photograph No. 4 was taken from a section of an

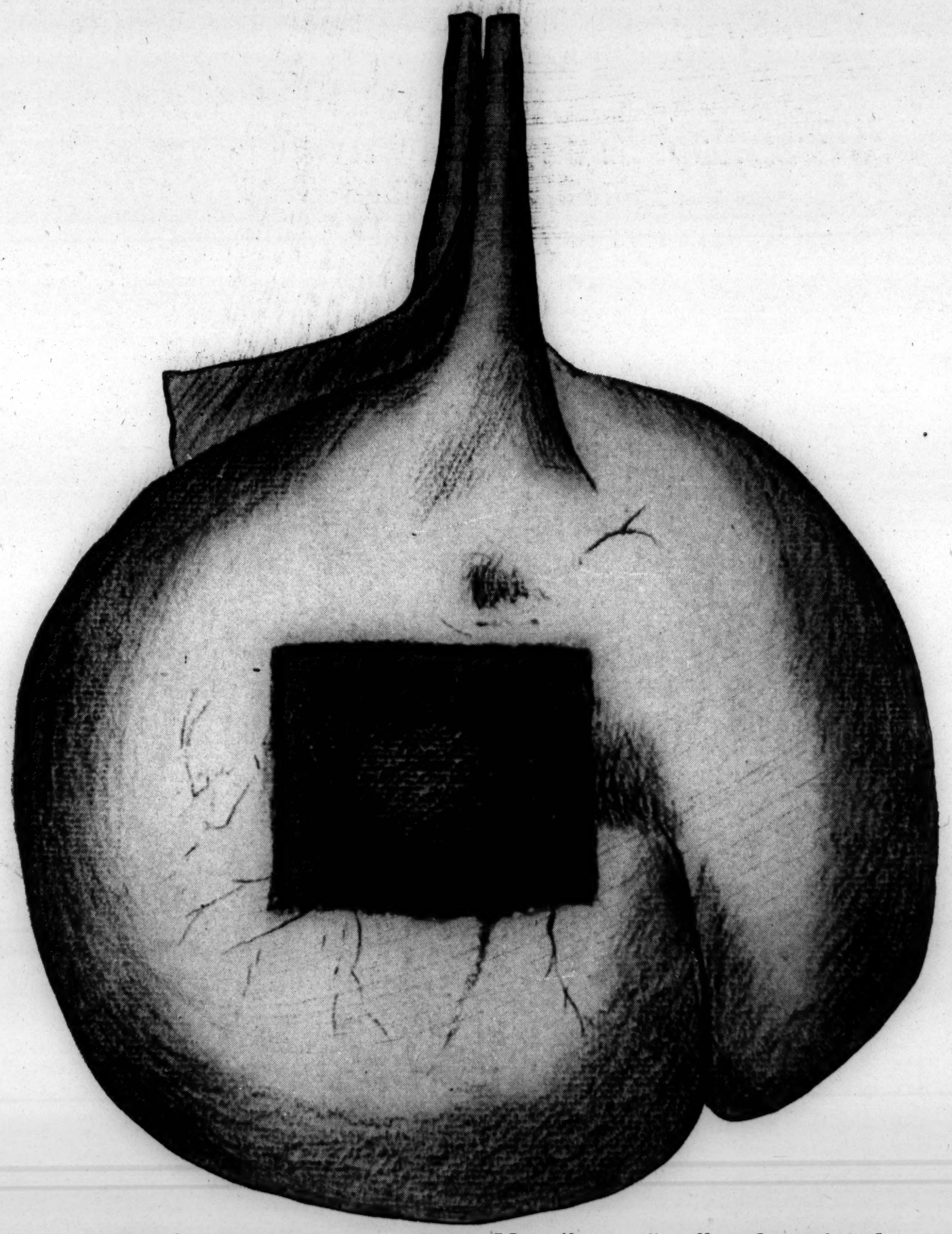


Fig. 8. Robson's case. From Moynihan. Small pedunculated cyst.

enlarged mesenteric gland in the vicinity of the cyst. Microscopical examination shows the capsule to be intact. The structure does not differ from the normal

gland, except that we find a general hyperplasia of all the elements.

The photograph shows the lymph spaces of the periphery and compact masses of lymph tissue below.

These microphotographs were made with the low power to include a wide field.

Undoubtedly, then, we are warranted in coinciding with Moynihan[9] in the opinion that the origin of chylous cysts is manifold, and in disagreeing with Dowd[10] when he says that they are all embryonic in origin. It naturally follows that there can be nothing constantly distinctive in the pathology of chylous cysts of the mesentery except their contents and their location between the folds of the mesentery. Microscopically glandular endothelium will be found in cysts originating in degeneration of lymph glands, and endothelium in those originating from dilatation of lymph vessels, provided, however, atrophy of these elements has not resulted from pressure. Naturally those cysts arising from rupture of lymph vessels will not present endothelium on the inner surface of their walls.

These cysts may be unilocular or multilocular, single or multiple. Multilocular chylous cysts may undoubtedly become unilocular by pressure-absorption, just as obtains in ovarian cysts. It is also possible for multiple cysts to become, by this same process, first multilocular and single, and finally single and unilocular.

In appearance these cysts are usually creamy white, and have large vessels traversing their walls. Accidents, such as volvulus, hemorrhage into the cysts or cyst wall, and peritonitis, may change their color, and render the vessels indistinct. Usually these cysts have no distinct pedicle, but they may have.

The relation of the bowel to the cyst varies much. The accompanying illustrations (Figs. 5, 6, 7, and 8) show some of the varying conditions that have been noted along these latter lines.

Diagnosis.—An exact diagnosis is practically impossible, neither is it necessary. It goes without saying that one cannot have any idea of the character of the cyst contents until he sees them, unless tapping is resorted to, and this proceeding is to be condemned.

Developing in the mesentery of the small intestine as the large majority of these tumors do their location and attachment, when the latter is determinable, is somewhat distinctive. A centrally located, movable, fluctuating tumor would raise a strong suspicion of mesenteric cyst, and if the tumor were crossed by a portion of the intestine the suspicion would become conviction. Cysts of the mesentery more often cause abdominal pain than do any cystic abdominal tumors. Hence the diagnostic significance of pain in these cases. The same thing may be said of vomiting also. Especially significant are these symptoms if unaccompanied by signs of infection or other complications.

Von Blum[18] was the first to call attention to the diagnostic significance of recurring attacks of volvulus in mesenteric cyst. The patient whose case he reported had had five or six attacks prior to the time of operation. This was true of my own case and also of several others of whch I have read in reports.

Recurrent attacks of belly pain, accompanied by symptoms of bowel obstruction in a case presenting a centrally attached abdominal tumor, would strongly suggest mesenteric cyst.

Chronic, increasing, obstinate constipation is not infrequently present in these cases, and is due to the stretching and flattening of the bowel as it crosses the cyst.

The age of the patient is of little or no diagnostic importance. A number of cases under ten years are reported, but the average age in fifteen cases was found to be over thirty-four years.

The frequency with which the history of trauma is given by these patients would seem to show that this

might be of some aid in differential diagnosis. In some cases, as in my own, for instance, where there were a number of relatively widely separated small cysts which produced no appreciable tumor until volvulus resulted, even an approximately correct diagnosis will not be possible before the abdomen is opened. With care, however, the diagnosis of mesenteric cysts may be made in the majority of cases, though the character of the cyst contents cannot be determined until the abdomen is opened.

Treatment.—That mesenteric cysts of all kinds seriously endanger life there can be no question, hence there can be no question but that their removal, as soon as the diagnosis is made, is the only proper line of treatment to follow.

As to exactly what method should be adopted in their removal there is great difference of opinion, but it appears evident that this difference arises from the fact that conclusions have been reached from too narrow premises. Those cysts which have a well defined pedicle are best removed after ligating the pedicle, as in ovarian cysts. Others may be easily and safely enucleated; others will be best treated by stitching the open sac to the parietal peritoneum and draining. The fear entertained by some, and very naturally, that there might be danger of a permanent chylous fistula in cases treated by drainage has proven unfounded.

There are other cases in which resection of the bowel, together with that portion of the mesentery containing the cyst or cysts, will be required. Such a procedure seemed best in my case. Drainage was out of the question because of the number of the cysts, while either enucleation or excision would certainly have lead to gangrene of the bowel.

CONCLUSIONS

1. Chylous cysts of the mesentery are to be classed

TABLE OF CASES

No.	Reporter	Where Reported.	Age.	Sex.	Origin.	Operation	Result.	Remarks.
1	Bramann.	Langenbeck's Archiv., Vol. 35.	63	M.	Receptaculum chyli. Between folds of mesentery	Incision, walls stitched to skin and drained.	R.	Tumor was size of child's head.
2	Kilian.	Berlin. K. Woch., Nov 25, 1888.	61	F.	Thoracic duct.	Incision and drained.	R.	Had been tapped twice and refilled (4700 cc. chyle withdrawn).
3	Kuester.	Ein Chir. Erkentniss, Berlin, 1882.	21	F.	Between folds of mesentery	Extirpation.	D.	Death due to peritonitis from wounding bowel. Size of adult head
4	W.	Milliard and Tilhaut's paper, Berlin. K Woch., 1887 No. 23	31	M	Degenerated mesenteric gland	Extirpation	R	Kidney size.
5	Werth.	Archiv f. Gynecol., 1882 Vol. 19	?	?	Mesenteric gland.	Extirpation	R.	Size of child's head.
6	Wyenin and Petroff.	Dhevnik Kazans Kaho Obsch. Watchis, Nos. 7 and 8, 1888, also London Med. Record, Aug. 20, 1888	26	F.	Mesenteric glands.	Extirpation.	R.	Case was Wyenin and Petroff's, operated by Fenominoff.
7	Carson.	Jour. A. M. A., May 10, 1890.	42	M	Not known.	Incision and drainage	R.	Large as adult head. Wall very thick and hard.
8	Moynihan.	ANNALS OF SURGERY, July, 1897.	18	F.	Mesentery of ileum.	Enucleation.	R.	Operated in second attack of pain, tenderness and vomiting.
9	Moynihan.	ANNALS OF SURGERY, July, 1897.	7	M	Mesentery of ileum.	Pedicle ligated and cyst removed	D.	Pain, tenderness and vomiting were symptoms.
10	Syms.	ANNALS OF SURGERY, Vol. 23, p. 605.	19	M.	Mesentery of ileum.	Cyst enucleated, mesentery closed.	R	Contained 14 ounces of chyle.

TABLE OF CASES—*Continued*

No.	Reporter.	Where Reported	Age	Sex	Origin.	Operation.	Result.	Remarks.
11	Eppinger	By Carson in Jour A. M. A., May 10, 1890	Not given.	Not given.	Not given.	Found post mortem.	....	Reported as dermoid, but regarded as chylous by Werth.
12	Rosch.	Trans. London, Obs. Soc., 1889.	27	F	Mesentery of small bowel.	Cyst stitched to abdominal wall and drained	R.	Six pints of chyle. Pain in belly led to discovery of tumor
13	Mendes de Leo.	Amer Jour. Obs., Vol. 24, 1881	27	F.	Not given.	Cyst opened, stitched to abdomen, drainage.	R.	Tumor very movable and caused severe pain.
14	Fetherston.	Australian Med. Journal, 1890. New Series, No. 12.	33	F.	Mesentery of ileum.	Well-formed pedicle, transfixed and tied.	R.	Three pints chyle. Had had several severe attacks of belly pain. Glass drainage in abdomen.
15	Porter.	Present paper	22	M.	Mesentery of ileum, degenerated lymph-glands.	Excision of cysts with bowel, anastomosis with Murphy button.	D.	Died from small leakage of mesenteric attachment, which occurred on seventh day. Numerous attacks of belly pain.
16	Rokitausky.	Lehrbuch der Pathol.	53	M.	Mesenteric gland.	Found post mortem.		
17	Enzmann.	Basle Quang Dis	77	F.	Thoracic duct.	Patient died of endocarditis		Walls of cyst thick and flabby. Contents inspissated chyle, cinnamon brown in color.
18	Rokitausky.	Lehrbuch der Pathol.	36	M.	Mesenteric gland.	Found post mortem.	. ..	Several small cysts with thick walls and white contents, and one size of child's head, lobulated and containing rosy fluid with glutinous red and black lumps.
19	Virchow.	Berlin. K. Woch., Nov. 14, 1887.	Not given.	Not given	Not given.	Post mortem.	. ..	Multilocular.
20	Pitman.	Brit Med. Jour., May 16, 1887.	23	M.	Mesentery of small bowel.	Post mortem.	.. .	Patient died of peritonitis due to bowel obstruction

with the surgical rarities, being less common even than serous mesenteric cysts.

2. Many chylous cysts of the mesentery begin as multiple cysts, later become multilocular, and finally unilocular by the process of pressure adsorption.

3. The origin of chylous cysts is manifold, and the microscopic pathology varies equally.

4. Trauma seems to be a causative factor in quite a number of chylous cysts.

5. Diagnosis of cyst of the mesentery may be impossible, but in the majority of cases can be made before opening the abdomen, although the character of the cyst contents cannot be determined by any safe procedure until the belly is opened.

6. The treatment of chylous cysts of the mesentery consists in their removal by that technic which seems best adapted to the case in hand after it has been studied through the open abdomen.

SUMMARY OF TABLE

Whole number of cases reported, 20.

Number operated upon, 14.

Total deaths in operated cases, 3.

Number of cases treated by excision or enucleation of cyst, 8, of which 6 recovered and 2 died.

Number of cases treated by incision, stitching sac to abdomen, and draining, 5, all of which recovered.

One case treated by excision of cyst, mesentery, and bowel, died.

Only 6 cases were found reported post-mortem, which would seem to prove that when present chylous cysts of the mesentery usually manifest themselves by symptoms sufficiently pronounced to lead the host to consult a physician.

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DISCUSSION OF THE FOUR PRECEDING PAPERS

DR. A. W. ABBOTT, of Minneapolis, Minn.—I wish to cite some experiments which I have made in twelve cases of tubercular peritonitis. They were all cases that were accompanied by more or less ascites. The method I adopted was practically this: After opening the abdomen and allowing the fluid to drain out, the peritoneum has been closed as well as possible, and then between some of the stitches a canula was introduced and the abdomen filled with pure oxygen; the abdomen is then closed entirely and left in that condition. These twelve patients have made perfect recoveries. There has been no recurrence, and it has seemed to me that the recovery was more rapid than in the other cases where this treatment was not undertaken. Of course, that has been almost impossible to determine scientifically; but, it seems to me that the recovery has been more rapid and satisfactory in those cases, and I shall continue that practice until something better turns up.

DR. CHARLE. H. MAYO, of Rochester, Minnesota.—I do not care to talk about any of the papers excepting the one upon tubercular peritonitis. About three per cent of the cases that come to us for abdominal operation do so because of tuberculosis involving the abdomen, usually the peritoneum, or conglomerate tuberculosis of the intestine. Nearly all of the papers written upon tubercular peritonitis say little or nothing about the cause. They treat of the subject of ascites and adhesions, and miliary deposits and adhesions upon the intestines. Then comes the question of wonder why certain types of operation effect a cure.

We have had something over two hundred operations for tubercular peritonitis of some type involving the peritoneum. I believe in nearly all cases where this tissue is involved by tuberculosis, it is of mucous membrane origin; that in the ascitic cases it is the mucous membrance origin which is closed

from any other outlet, usually the appendix, or the tube. About four of these cases of tubercular peritonitis occur in women to one in man, both being subject to the type of appendix trouble, but the excess in the women is due to tubal involvement. In our earlier work we tried opening up of the abdomen, letting in air and sunlight. Then came the method of emptying out the fluid with trocar and pouring in some agent to maintain local irritation for a prolonged period, like the use of iodoform. This used for a period of a few weeks kept up a process of active local leucocytosis. But it required a different type of inflammatory disease and irritation from that which is produced by tuberculosis. The action of the leucocytes or phagocytes kept up a local irritation which resulted in adhesions. In our early work in operating on these cases of ascites we opened the abdomen and found the bowel studded with miliary deposits, also the parietal peritoneum, tubes, or appendix, and all sorts of structures were visibly covered by the tuberculous condition, so that it seemed absolutely unnecessary to pick out any one part for removal, leaving so large a part diseased.

Later, Murphy brought out the point of mucous membrane involvement, showing that in the early cases where the mucous membrane lesions leaked into the peritoneum, local peritonitis developed, as well as ascites, and nature was absolutely prevented from forming adhesions which would have protected the general peritoneum from the local tuberculosis. The ascites occurred, the tube was free, or the appendix was free in the general peritoneal cavity, the question of reoperation came up. We noticed in the first operations we made ascites was present; the fluid was thin, and at subsequent operations there were more adhesions present. The ascitic fluid became fibrinous, rapidly clotting, and later we had deposits which were furnished in women who had tubular involvement. Those women were relieved of their ascites because of the drying of the peritoneal cavity. The tube became closed from the general cavity because of adhesions of the intestine. The minute nature made an effort to fight tuberculosis by having it walled in and to get rid of the ascitic fluid, she would caseate the mass where it involved locally the mucous membrane, and later on these patients came back—say two or three years later —with a pelvic mass. At the subsequent operation, when we came to examine the abdominal condition, we could not find the miliary deposits which we discovered previously, but instead there was a mass of adhesions filling the pelvis. Sometimes we were able to get at the local tuberculosis by follow-

ing the round ligament. If one gets into the intestine in trying to get at the pelvic condition, it is almost impossible to cure such a fistulous process. The intestine could not be closed. The patients who had fistula died from a wasting phthisical condition. There was a constant fistulous process which kept up until death, which might take place a year later, so that in the cases which you think you have cured in a sense by getting rid of the ascitic condition, you really have not removed the original focus, so that in all operations we have made in recent years, whenever we have opened the abdomen and found such a tuberculous condition, the incision was at once enlarged until we could examine the regions involved. This meant the involvement of the appendix in one-fifth of the cases; in four-fifths the tubes. In all that series of cases there have been only four in which the lesion apparently was situated in the upper abdomen, as indicated by examining the peritoneum. In the four instances in which the upper abdomen was involved, three cases were in men, and one in woman. In these cases there was not so much the ascitic type of tuberculosis as there was a local condition of walling-off from the transverse colon. We could not exactly locate the lesion, but it was probably a tuberculous ulceration of the intestine, with a leakage, and that type of case usually takes care of itself. The patients were operated on for abdominal tumor, we not knowing the cause of the trouble until we found miliary tuberculosis; so that I think in every type of ascitic tuberculosis, or in tubercular conditions of the peritoneum, the first essential feature is to get rid of the local lesion and prevent reoperation for the ascitic condition, in order to effect a cure.

Dr. B. B. Davis, of Omaha, Nebraska.—I wish to say a few words in regard to the paper on the treatment of general peritonitis. I am in accord with Dr. Macrae in many things that he has said. For instance, I do not believe in flushing. I came to the conclusion that flushing is not a good thing from my own experience, in that it seemed to me that the cases I did not flush did better than those where flushing was carried out. There must be some reason for this fact, and the way I look at it is this: When we flush the abdominal cavity, we cannot get rid of all the toxic material by any means. We all know how inefficient our methods of flushing are. Before operation, the peritoneum is covered over by more or less solid material, and consequently the rapidity of absorption is very much reduced. Just as soon as we throw in a lot of water, and flush out the cavity, we put the toxins pres-

ent in a condition of solution; there is a thinning of the fluid where we wash the solids from the peritoneum, and consequently we put it in a condition where there is going to be much more rapid absorption than before. That is the reason I should condemn flushing.

In the matter of drainage, I use drainage tubes, but I also employ gauze, and if I were only going to use one, I believe I should use gauze, because it is capillary drainage that counts. I sit the patients up at an angle of forty-five to fifty degrees. That is a common procedure with all of us. I drain the pelvis; I drain the flanks. Another point in connection with the use of drainage is that we should not close up the incisions enough so that there is the least bit of compression at the point where the gauze and the tube come through the abdominal wall. If you have a wick of gauze in a pocket where it is draining, and you tie a string around the gauze at some point loosely, it will practically stop the capillary action, and drainage will cease; and, it seems to me, for the same reason we should never in any way constrict the gauze as it passes through the abdominal wall.

I use a good deal of gauze. There is a limit to what we can use well, but the more gauze we use, the more rapidly do we empty the abdominal cavity.

Experiments have been carried out to find out how long it takes a drain to become encysted and walled off, so that it no longer has any effect. These experiments have been done on the normal peritoneum. An experiment with the normal peritoneum is absolutely different from the conditions we find when we have an inflamed peritoneum, and although I believe it becomes encysted in a comparatively short time, I do not believe that the conclusions we draw from the normal peritoneum will apply to the inflamed peritoneum. It takes three or four times as long for the drains to become encysted and have any effect on the inflamed peritoneum as in one where the condition is normal.

I have no doubt that the work with reference to infective peritonitis has been absolutely revolutionized in the last few years. Different men will use slightly different methods, and there are two or three cardinal principles to be borne in mind, and among them free drainage and the putting of the patients in the Fowler position. These two things are well-established. In addition, the question arises whether to flush or not, and the kind of drainage to use. Those are somewhat in abeyance. It is said, we can get

better results if we do not flush than if we do, and we get better results if we use free drainage than if we only employ a moderate amount of drainage.

Dr. Van Buren Knott, of Sioux City, Iowa.—This subject of peritoneal drainage in the treatment of general or diffuse peritonitis, as has been well said, is extremely important. During the last three or four years it has been a constant surprise to me to notice in the work of various surgeons around the country the various methods of applying peritoneal drainage and the various ideas as to the mechanics of drainage which seem to prevail.

As to the matter of flushing, I have had the same experience in the treatment of diffuse peritonitis that you have all had. In years past I sat around and watched all these patients die, practically all of them. I have treated them without flushing and with flushing. I have treated them with gauze drains and tube drains, introduced here and there, with the feet and then the head elevated, and after having tried all the various procedures advocated, at least, all of those that I have seen employed or read about, in my own work, I have come to the conclusion that the method of treatment which I have outlined in a paper which I read before the Association last winter, and again in Chicago this spring, has given by far the best results.

Dr. Davis speaks in favor of gauze as a drain and prefers it to a tube. Gauze will not drain pus from the peritoneal or any other cavity and the practice of corking up septic fluids with a wad of gauze should be discontinued and free exit for these fluids provided in the form of a large tube.

As to the statement that the septic material in the peritoneal cavity is so thick that it protects the peritoneal surface and should be allowed to remain for that purpose; if it is so thick that it won't come out or cannot be discharged, it should be irrigated.

The peritoneal cavity can be cleaned with very little manipulation and with very little shock by proper irrigation. There are various methods of irrigating the cavity, but in my opinion there is only one correct method. The only way to irrigate the peritoneal cavity is to introduce a tube at the top of the cavity and let the natural force of the irrigator be employed, and have this force employed with the patient in the elevated position, so that the stream flows from the diaphragm, towards the pelvis, thus completing the irrigation. If you attempt by elevation of the receptacle containing the fluid to get force upon the irrigating stream, the trauma conveyed

to the peritoneal surface will counterbalance the good effects of the irrigation. I really believe that irrigation in the class of cases under consideration applied in the manner I have described does do good, effective work, and will save life. Under no consideration is the peritoneal cavity to be irrigated unless the infection is diffuse. The term general peritonitis is a poor term. It should not be used, because we cannot at any operation be certain that every portion of the peritoneal cavity is involved. By the term diffuse peritonitis, on the other hand, we mean a peritonitis which involves as much of the surface of the peritoneum as we can detect at the time of the operation.

Cases in which the upper and lower quadrants of the abdomen are involved should be irrigated. If two-thirds, three-quarters, one-half or a third, or only one-fifteenth portion of the peritoneal cavity is involved in the septic process, it should not be irrigated. If, during the operation, we cannot detect any free portion of the peritoneum I believe irrigation is not only proper, but will save life.

As to the experimental work of Dr. Yates, he did not put a single drain in the peritoneal cavity of dogs where it would drain the cavity. These drainage tubes were applied through the loins, through the flanks, through wounds of both recti muscles, and one in the median line, both high and low. None of them were placed in the bottom of the sac. Everybody knows how to empty a vessel, and that is to knock the bottom out of it. If you wish to drain a cavity, cut a hole in the bottom and you can drain it easily. Drainage of the peritoneal cavity, as it has been applied for years, has been absolutely wrong. To attempt to drain a localized area of the peritoneal cavity, as I have pointed out in former articles on the subject, is fallacious, is impossible. I agree with Dr. Yates to that extent. If we attempt to drain a localized area of the peritoneal cavity by introducing a drain anywhere above the bottom, it will result in rapid closing in of the drain by adhesions, with an increased tendency toward post-operative obstruction. You drain nothing except the track made by the drain itself. In the female, this danger does not exist, as the drain should be introduced through the vagina, the peritoneal portion of the drain cut off and it comes in contact with none of the viscera. We are talking about cases now in which no adhesions exist. In males the tube should be introduced through the abdominal wall to the bottom of the cavity. In some cases it has been necessary to reopen the abdomen for obstruction or complications which have occurred later

on account of inefficient drainage. I have found in some cases this condition to exist; The abdominal end of the tube is shut in by adhesions from an inch to two or three inches from the peritoneum, there is an area which is not shut off by adhesions communicating freely with the upper abdomen. With the tube at the lowest point, and the patient well elevated, the fluids, as we know from former experience, will accumulate in the bottom of the pelvis from which point they may be drained.

As to placing localized drainage, if, as we frequently find at operation in appendicitis the appendix is perforated the escaping septic contents from that appendix have already, before you have gotten in there, soiled the peritoneum from the level of the appendix to the bottom of the peritoneal cavity. After the removal of the appendix what is the object of placing a localized drain over the region formerly occupied by the appendix, leaving three or four inches below it of soiled peritoneum which will not be drained? It is unnecessary to place a drain around a perforated ulcer which has been repaired or the stump of an appendix unless you fear extension of the gangrenous or necrotic process, when gauze may be used more for quarantine than for drainage. If this portion of the peritoneal cavity is no more soiled than the rest of it below, then I believe the less drainage we use, or the smaller number of drains we use, the better, and I am absolutely of the opinion in all cases of diffuse peritonitis but one drain is necessary, and that is a drain inserted at the bottom of the pelvis.

As to the method of drainage recommended by Dr. Jepson, drainage of the male pelvis through a stab wound through the perineum if it can be instituted quickly, and without damage to the surrounding tissues, it is an admirable form of drainage. We must remember, however, that these patients in whom this drainage is advocated are in a very precarious condition; they will not stand a prolonged operation, and if we cannot institute drainage by quick puncture, I fear the mortality may be increased by extending the length of time of the operation. I have had no experience with this form of drainage; I wish we could do it, but I have not had the temerity to take up its use.

Dr. J. W. Andrews, of Mankato, Minn.—I well remember hearing Dr. Howard Kelly make the statement that post-operative peritonitis is singularly fatal, and so it is. I think the majority of cases of post-operative peritonitis are fatal. I believe thoroughly in drainage. It is a question in my mind whether flushing, as indicated by Dr. Knott in his remarks,

is wise. If the infection is purely local, and we can flush only a portion of the peritoneal cavity, leaving the rest of the peritoneal cavity free from the effects of our flushing, I will admit good may result. But that is a very difficult thing to do. I do not see why the principle of drainage which we use in the pleural cavity cannot be applied to the peritoneal cavity, and I think we have long since ceased to flush the pleural cavity in purulent pleurisy. I remember a few years ago of hearing Dr. James E. Moore in a discussion make this remark, that "gauze will not drain pus," and I am prepared to-day to confirm that statement, for I have observed in many cases since, where I tried to use gauze, it did not drain pus. Hence I would object to the introduction of gauze through a drainage tube; I would rather leave the tube open, whether it be a rubber tube or otherwise, instead of filling it with gauze. If the gauze is introduced through the tube very lightly so as not to interfere with drainage through the tube, it may be of value. It may be useful. But if a drainage tube is filled with gauze, it will not drain, but you will defeat the object of your drainage.

I understood Dr. Potter in his paper to advocate the breaking up of adhesions in tubercular peritonitis. Possibly I misunderstood him, but if I understood him rightly, I should certainly take issue with him. I do not believe the adhesions, no matter how great they may be in tubercular peritonitis, ought to be broken up. In our earlier operations, where we tried to do that, we lost patients; we only opened new avenues of infection and violated a principle which holds good here as in tuberculous joints.

I was quite impressed with the remarks of Dr. Mayo as regards local infection of tubercular peritonitis. I operated a few days ago on a girl, 20 years of age, for tubercular peritonitis. I found the tubes and appendix involved; the disease did not extend down the peritoneum and beyond the tubes and appendix. I removed both tubes and appendix, and the patient is making a good convalescence, and I believe she will fully recover.

Some one in discussing Dr. Grant's paper this morning made this remark in regard to the removal of cancer of the colon, that he had regretted having done too much in performing those operations. I think the same principle will apply to tubercular peritonitis—don't do too much.

My experience may not agree with that of many of the members, but, I believe, as a rule, it is not wise or necessary to drain in cases of tubercular peritonitis, and my successes have not been as great where I have drained in tuber-

cular peritonitis as where I have thoroughly cleaned out the abdominal cavity with sponge cloths wrung out of normal salt solution, and have satisfied myself with that. No flushing; no drainage.

Dr. I. B. Perkins, of Denver, Colorado.—I believe that the elevated position is very useful in these cases of general peritonitis. I, like everyone else, lost practically all of my cases regardless of whether I had drained or flushed, and I did not cease flushing until this elevated position was recommended. Since using it I have lost fewer patients.

Within the last year I have adopted the use of streptolytic serum, in addition to employing drainage and the elevated position. I have not flushed except in one case, and I lost that. Death was not due to the flushing, however, but to the bad condition of the patient at the time she was admitted to the hospital. She was practically moribund. Of ten cases that is the only one I have lost. I have given large doses of the streptolytic serum—40 c. c. at a dose, and in one instance 80 c. c. This case was one of perforation of the bowel, due to the kick of a horse. I operated three days after the injury, when there was more than a quart of fecal matter in the abdominal cavity. In this case I was compelled to use only gauze drainage as the operation was done in a country town, and I had no drainage tubes with me. I like better the combined drainage—tube and gauze, with a strip of gauze inside of a split tube, and another piece of gauze carefully placed coming out by the side of the tube. Gauze in the tube produces a better, capillary effect.

The statement made that gauze will not drain pus is correct; but in these cases our danger is not from pus. When it gets to be thick pus there is not so much danger; it is not so infectious. It is when it is in the watery state that drainage is most needed.

One thing that has helped me in these cases will be a comfort to you, if you have not tried it. That is a swing for the purpose of holding these patients up in bed when in the Fowler position. I had a great deal of trouble in keeping them in a high position, until it occurred to me to use an ordinary swing. I take a board not more than three inches in width, bore a hole in each end of it, put a rope through and tie a knot in the end; the rope is tied to the top of the bed. I put one or two pillows on the board, and then I have a comfortable seat in this elevated position for the patient. They will sit up in that position week after week

without saying much about it. The feet will swell sometimes, but that is of little consequence.

Another thing that seems to me important in these cases is elimination. We want to get as much elimination as possible, and there is no better way in which to get it than by giving large quantities of water. The administration of water under the skin, especially in the elevated position, to patients who are not able to retain it well is annoying. I find in the elevated position patients do not vomit very readily. In fact, if I have a patient who is vomiting from anesthesia and put her in the Fowler position, there is a chance to drain the stomach, and usually the nausea ceases. In this way you can fill the stomach with water and it will gravitate into the bowel and be absorbed, and there will be very little vomiting and practically no regurgitation. There will be little thirst and usually a good quantity will be secreted by the kidneys.

Dr. M. L. Harris, of Chicago.—Just a few words in regard to drainage of the peritoneal cavity. Reference has been made to a recent article on this subject, and exception taken to some of the conclusions drawn by the author. The chief error in that paper is an attempt to generalize from insufficient knowledge. These experiments were made on the peritoneum of the dog, and the conclusions are supposed to cover the diseased peritoneum in the human subject, and if those conclusions be applied to the diseased peritoneum in the human subject much harm will result from this paper. If the writer had said that his conclusions apply simply to the experiments which he had made on dogs, then they would have been true, but when they are applied to diseased peritoneum in the human subject they are not all true.

Peritonitis is always primarily a local disease. It starts from a distinct focus. It is one of the properties of the peritoneum, when irritated, to throw out a plastic exudate, the object being to circumscribe the agents which produce the irritation. Whenever we find in peritonitis this exudate, about a circumscribed, primary focus of infection, we know at once that the case is not serious, and we operate on such cases almost constantly with a very low mortality. The serious cases are the ones in which, when we open the abdomen, we find no attempt made at the formation of a plastic exudate. When we find the omentum floating free in the cavity, with a quantity of sero-pus or pus, we know at once that that is a serious case because there is no attempt made to limit the extent of that inflammation. In

those cases where there is absolutely no attempt made to limit the primary focal point of infection, gravitation determines the direction of the fluids. If you set the patient up fluids gravitate just as certainly as water runs down hill. Those are the cases we drain. If you put a drain in a normal peritoneum, the drain will be immediately surrounded by plastic exudate. If you put a drain in the class of cases in which nature makes no attempt to form an exudate, it will drain sometimes for days. Whenever the peritoneum recovers itself so as to form an exudate, and circumscribe the area, the patient is going to get well. If it does not form an exudate about the drain, we know the peritoneum is recovering, and the patient will probably recover.

Dr. Potter (Closing the discussion on his part.)—

In closing this discussion I wish to refer to a few points that have been brought out by the different speakers.

The gentlemen who first took the floor, (Dr. Abbott), stated his experiments with the injection of oxygen, in twelve cases of tuberculous peritonitis. All of his cases recovered. To my mind that does not prove that oxygen was the curative agent, though, I believe the oxygen acted, when so introduced, as a stimulant to the cavity and invited to the peritoneal membrane leucocytes which have the power, by phagocytosis, to destroy both the tubercular nodules, and the germs.

In writing so short a paper as the one I have just presented upon this subject it is impossible to give many of the opinions of eminent writers as I wish I could have done.

Sometimes after operations for tubercular peritonitis some surgeons have found it necessary to reopen the abdomen at intervals of from two to four months for other troubles; and invariably the nodules and tubercles presenting themselves at the primary operation, showed they had disappeared or were recovering, for at the base of all the nodules and tubercles that were left, and seemed to be recovering, healthy granulations had formed or were forming, which condition could not have been the case without the presence of healthy white corpuscles which have the power to destroy the invading organisms as well as to repair the damage.

I was much interested in Dr. Mayo's discussion on this paper. I do not agree with him exactly, as to the mode of invasion. I cannot help being strongly of the opinion that the invasion of the peritoneum by the tubercular bacilli is through the blood. We have tubercular meningitis. How

do these micro-organisms reach the meninges if not carried there by the blood? We have also tubercular osteomyalitis and synovitis where the infection could not reach these parts excepting in this way.

I agree with Dr. Mayo that if we have a large cluster of tubercules upon any area of the peritoneum, in the omentum upon the fallopian tubes or upon the ovaries or appendix these structures should be removed.

In one instance I removed the entire omentum which was loaded with tubercular nodes. The woman recovered but died twelve months afterwards from another cause.

With reference to adhesions. I have had within the past three months two patients with peritoneal adhesions in these kind of cases, as a result of which, stricture of the bowels in the region of the sigmoid took place, and by opening the abdomen and breaking them up complete relief was afforded and both patients recovered. Where the adhesions are slight, I think they should be broken up, but where they are extensive is another question.

Dr. Macrae, Jr. (Closing the discussion on his part). I do not wish to be understood that I claim all cases to be cured by the method pointed out in my paper.

Much depends upon the early diagnosis and operative interference as well as upon the character of the micro-organism producing the infection. My personal experience with this technique, however, has convinced me of its superiority over all other methods. I do not know that I have any particular objection to flushing in this manner described by Dr. Knott.

I fear I did not get the point of Dr. Harris's discussion. If he is under the impression that Dr. Yates made experiments on the normal peritoneum only of the dog, he is mistaken, as Dr. Yates used the infected dog as well.

Dr. Yates however, did not drain the pelvic pouch in any case in connection with postural position. No tube or gauze inserted through the belly cavity can drain the general cavity. The sitting position with free drainage at the bottom of the pelvis, in my opinion will save many lives which by any other method must be sacrificed.

Dr Jepson (closing the discussion).—I only wish to say closing the discussion of this topic that we all seem to be in accord regarding one fact, namely, that all of our patients suffering from septic peritonitis arising from a lesion of the intestinal tract, or otherwise are threatened by death from toxemia. If we are to prevent this we must afford early

and efficient exit for the toxic products, the result of the inflammation, and the question simply resolves itself into one of how this is to be most efficiently accomplished. The ultimate results are the same if the drainage is thorough.

As regards the matter of flushing the infected area as compared with that of not doing so, I believe that it is of some advantage, provided the flushing is carried out so that it simply extends to the area that is invaded by the inflammation, and this can be brought about only by the employment of an amount of pressure by the irrigating fluid which will not be in excess of the intraabdominal tension exercised by the pent up inflammatory products prior to the time the abdomen was opened.

A NEW TECHNIC FOR BREAST AMPUTATION

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I wish briefly to present the description of a new technic for use in radical operations for carcinoma of the breast. This method of operation was devised by the author about eight months ago, and has since been used exclusively by him in all cases of this character with which he has had to deal. From this experience, though limited to eight cases, he believes that the method has certain elements of advantage, as well as originality, that justify him in presenting it for a wider field of service.

The skin incision in this operation is begun at a point about one and one-half inches below the middle of the clavicle, in the sulcus, marking the interval between the deltoid and the pectoralis major muscles. From this point the incision is carried in a straight line along the sulcus, parallel to the inner border of the deltoid muscle, until it reaches the lower border of the pectoral fold as it terminates in the arm. This straight incision is all that is made in this early step of the operation, but for the sake of clearness the complete incision is outlined here, that the general picture may thus be better obtained.

From the lower border of the first incision the knife is now carried along the under margin of the pectoral fold to the chest at a point which corresponds, as a rule, with the lower border of the mamma itself. The

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The plates illustrating this paper were loaned through the courtesy of the Jour. of the A. M. A.

remaining portion of the incision is made in the form of an ellipse about the nipple, with its long axis nearly vertical or, rather, obliquely from above downward

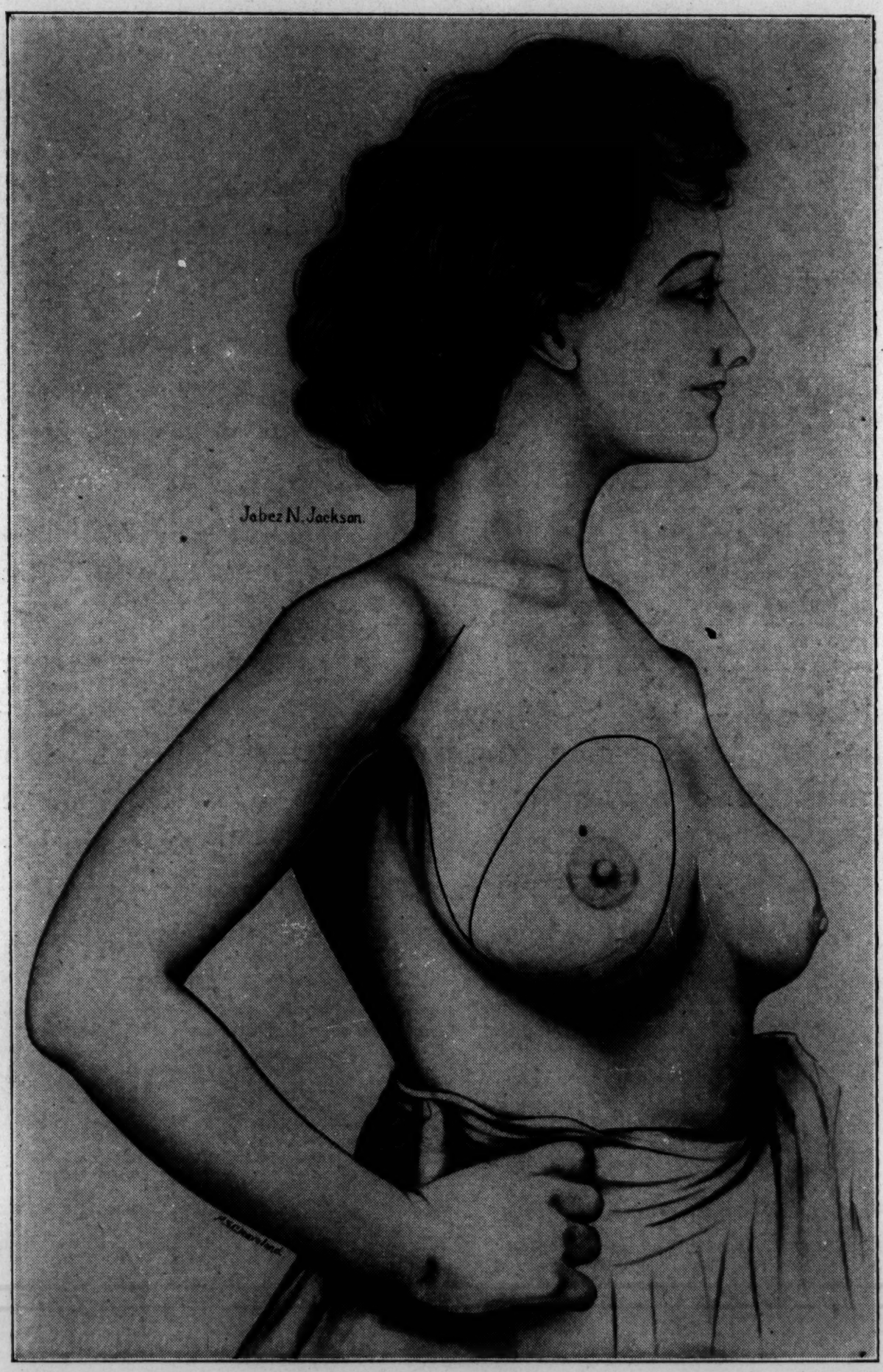


Fig. 1. Outline of skin incision complete, showing formation of flap A.

and outward to the outer quadrant of the breast. This ellipse is so planned as to practically make its outer

curve parallel with the line of the first incision made, and thus to present, when completed, a quadrilateral flap with its base upward, and entirely free below. This incision, of course, is carried through the skin

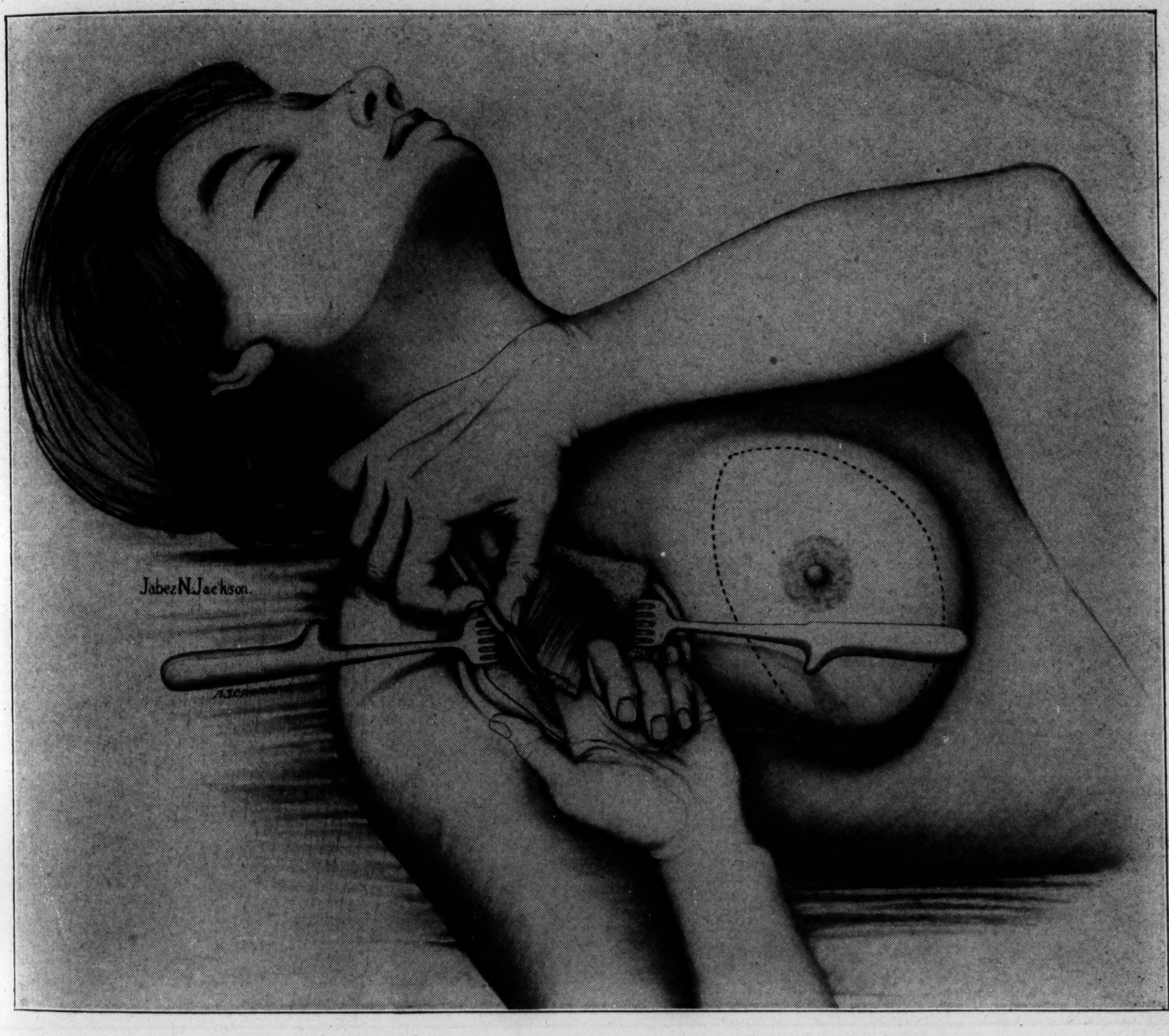


Fig. 2. Divisions of pectoralis major muscle at insertion through primary vertical incision.

and fascia down to the underlying muscular structures.

In the actual procedure, as before said, only the first incision is used in the early stages of the operation, but, if necessary to give greater space, a portion of the incision splitting the pectoral fold may likewise be

made. As this incision is carried down through the skin and superficial fascia, it exposes the fibers of the pectoralis major muscle converging well to its tendinous insertion on the humerus. At the lower point of

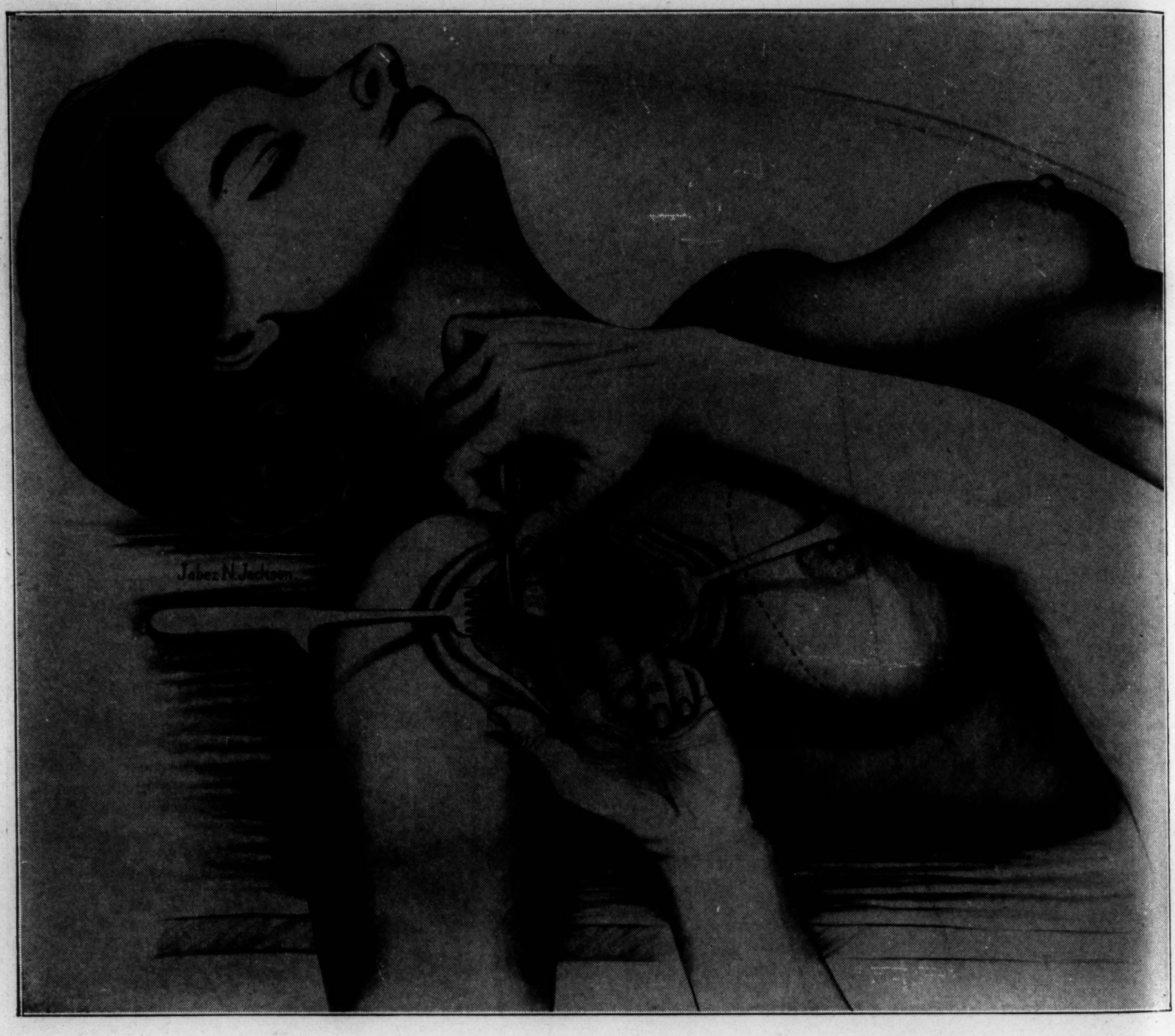


Fig. 3. Division of tendon of pectoralis minor at insertion.

this incision, where it curves along the under border of the pectoralis major, the index finger of one hand is now shoved up underneath the pectoralis major muscle and brought out again at its upper border, so that the entire pectoralis muscle is thus hooked up on the index finger, and with blunt work separated out to

its tendinous insertion. If, however, one wishes to follow the suggestion of Dr. C. H. Mayo and leave the clavicular portion of the pectoralis muscle, this can easily be accomplished by bringing the finger up

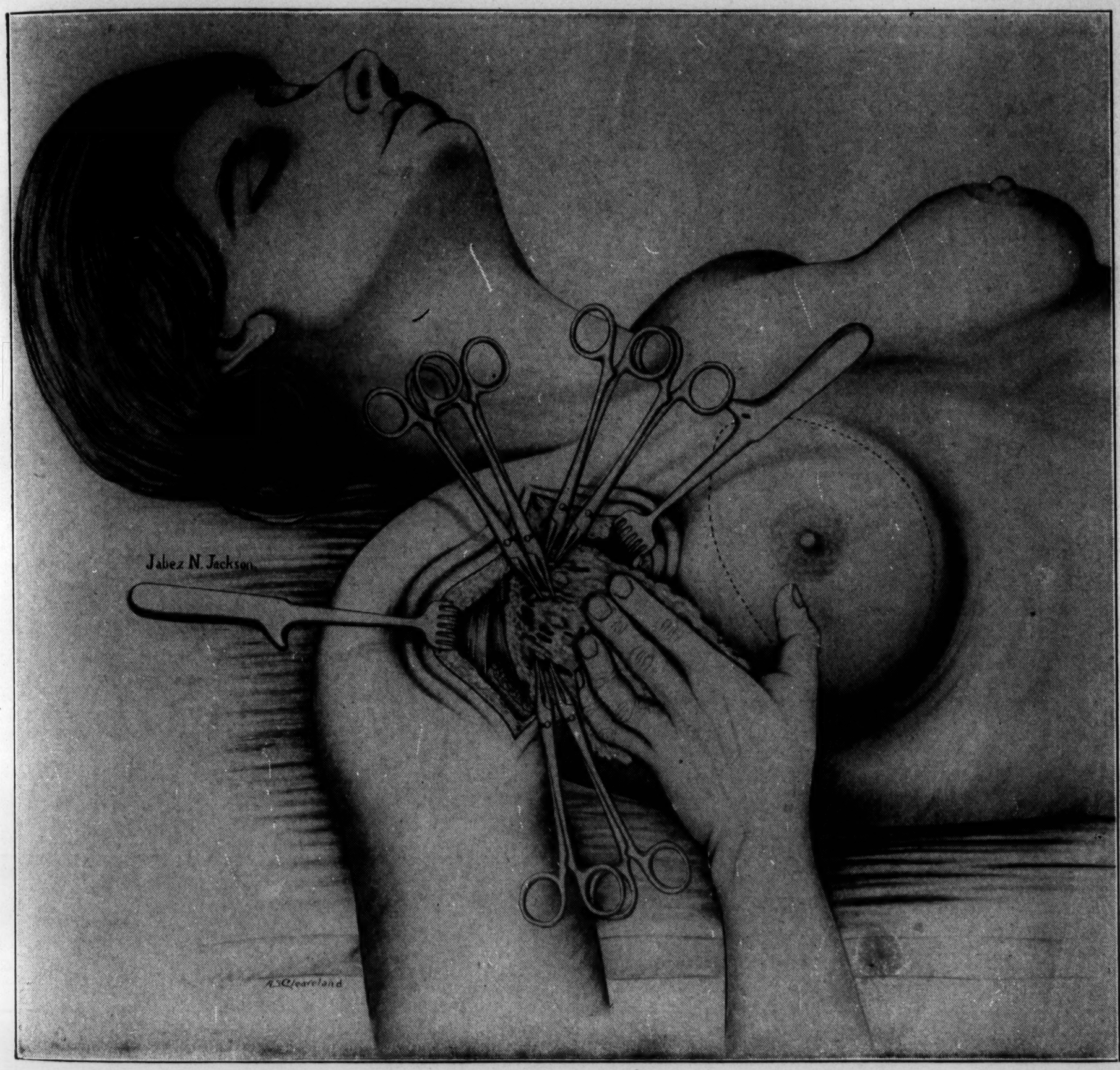


Fig. 4. Clearing fascia and glands from around axillary artery and veins, isolation at branches to fossa for primary ligature.

through the interval, usually well marked, between the clavicular and sternal portions of the muscle, and thus the clavicular portion can be separated and left in

place. With the tendons of the pectoralis muscle thus lifted up, as shown in Fig. 2, it is divided by the scalpel very close to its insertion into the humerus. The muscle immediately retracts toward the chest, and ex-

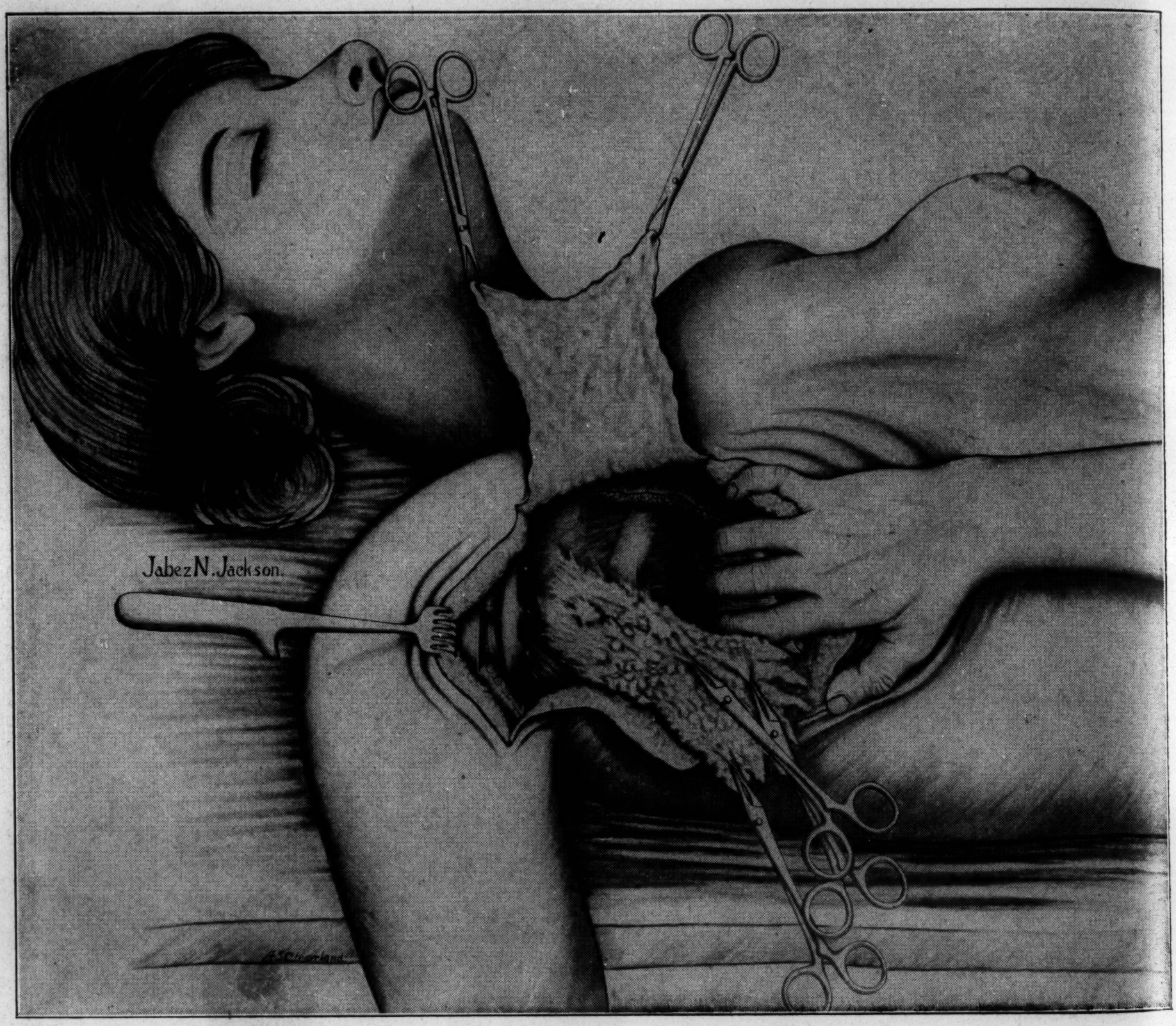


Fig. 5. Flap completed and turned upward. Branches from axillary artery and vein ligated, dissection being continued from apex of axillary fossa downward and outward beneath retracted pectoral muscles.

poses, underneath, the pectoralis minor muscle, invested in its fascia, which above runs to the clavicle and below spreads out over the chest walls. This can easily be exposed by blunt dissection of the finger.

which is now likewise slipped under its fibers, and it is isolated as was the pectoralis major. It is also divided close to its attachment to the coracoid process of the scapula. As the pectoralis minor, like the pectoralis

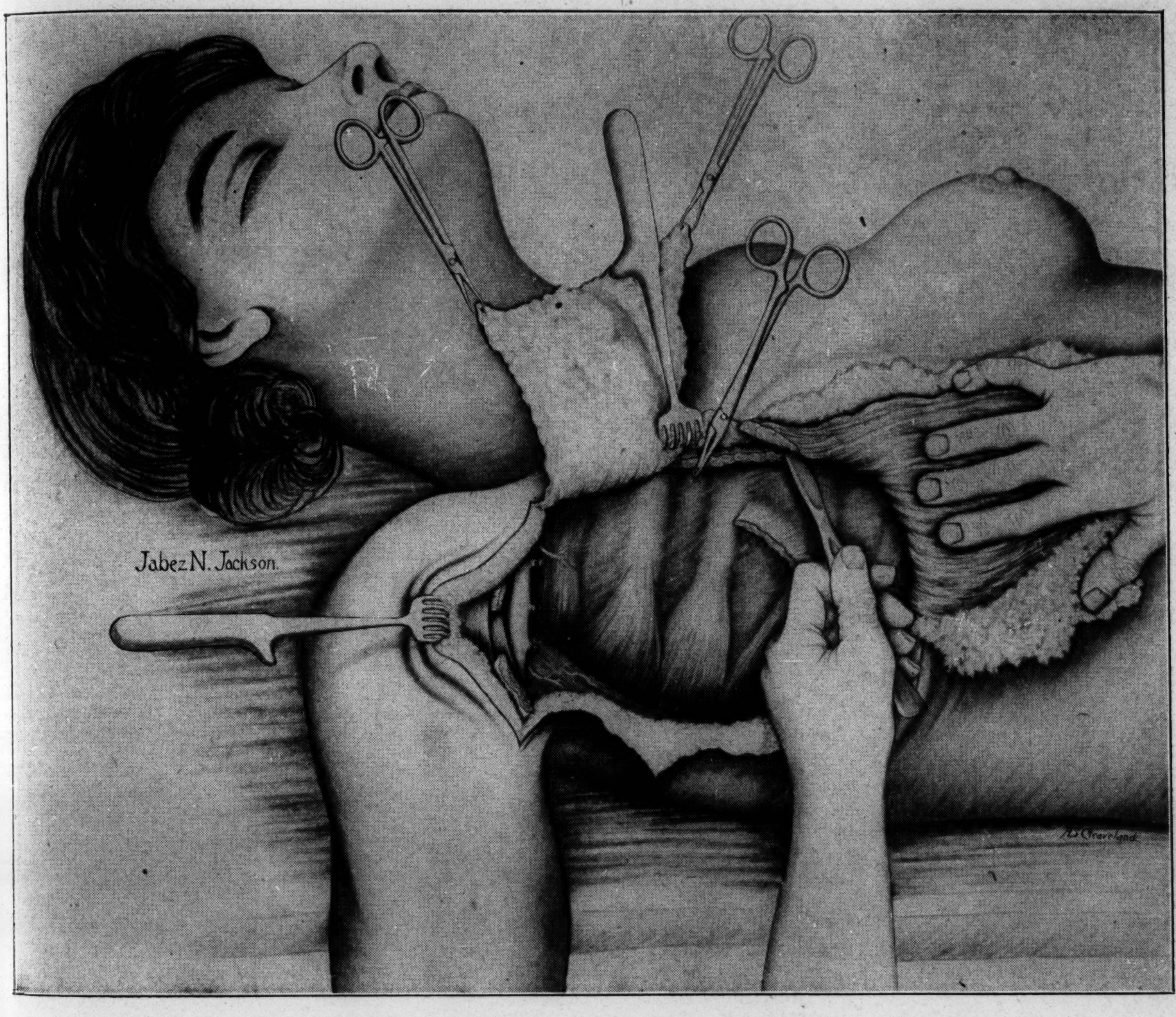


Fig. 6. Axillary dissection completed. Division of pectoral muscles at origin from beneath. Mammary branches caught and ligated on division. Amputation completed.

major, retracts toward the chest, the wound is held apart by retractors or by the fingers of an assistant, and the axillary space is now widely exposed to view from the front. As a rule this exposure can be made without encountering any bleeding vessels that will

require clamp or ligature. Likewise, we now have a wide exposure of the axilla for thorough dissection, without, in any way, having touched the breast or made any extensive division of tissues.

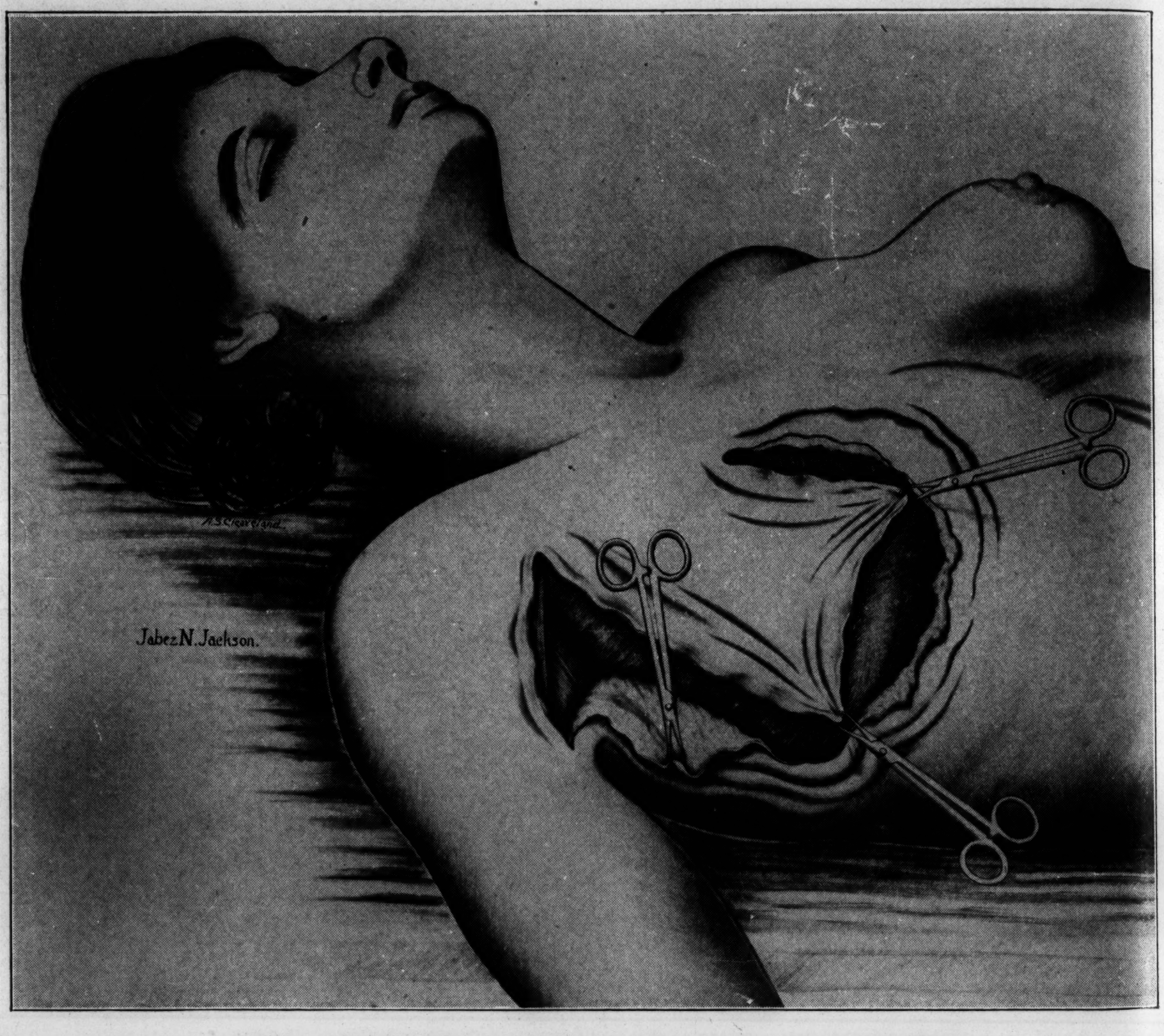


Fig. 7. Amputation completed. Flap A, the corners of which are held by tenacula, is drawn over to cover the chest defect, and the wound is closed by plastic adjustment. (The apparent laxity of the tissues is erroneous.)

We now demonstrate the axillary vein, which is readily in view, and to its outer side, and paralleling it, we make, with the scissors, an incision of the fascia which surrounds the vessels. We now begin stripping the fascia, usually with blunt dissection and gauze,

supplemented by occasional snipping with scissors, working steadily from without inward, toward the chest, and clearing the fascia, glands, etc., as we go. In a moment, with this blunt dissection, the axillary

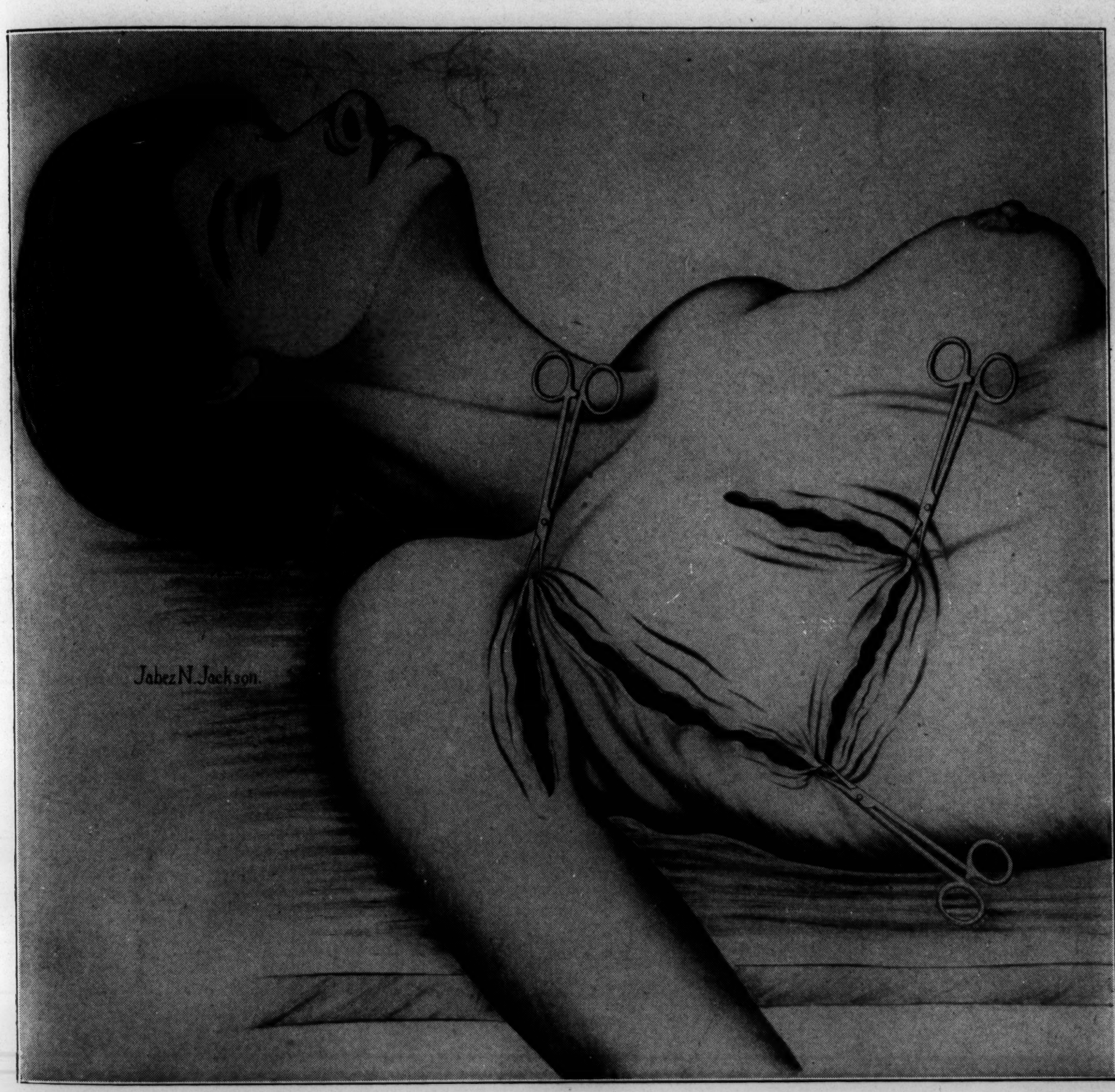


Fig. 8. Flap in place and fixed by tenacula. Loose skin of original axillary floor drawn upward to complete covering and hugging about axillary vessels, thus obliterating fossa axillaris.

vein and artery are isolated, and the branches supplying the axilla and going on to the chest are made plain-

ly apparent. These vessels we at once double clamp and divide between clamps. I have usually found it necessary thus to ligate about three or four sets of vessels. Time is saved by immediately ligating these ves-

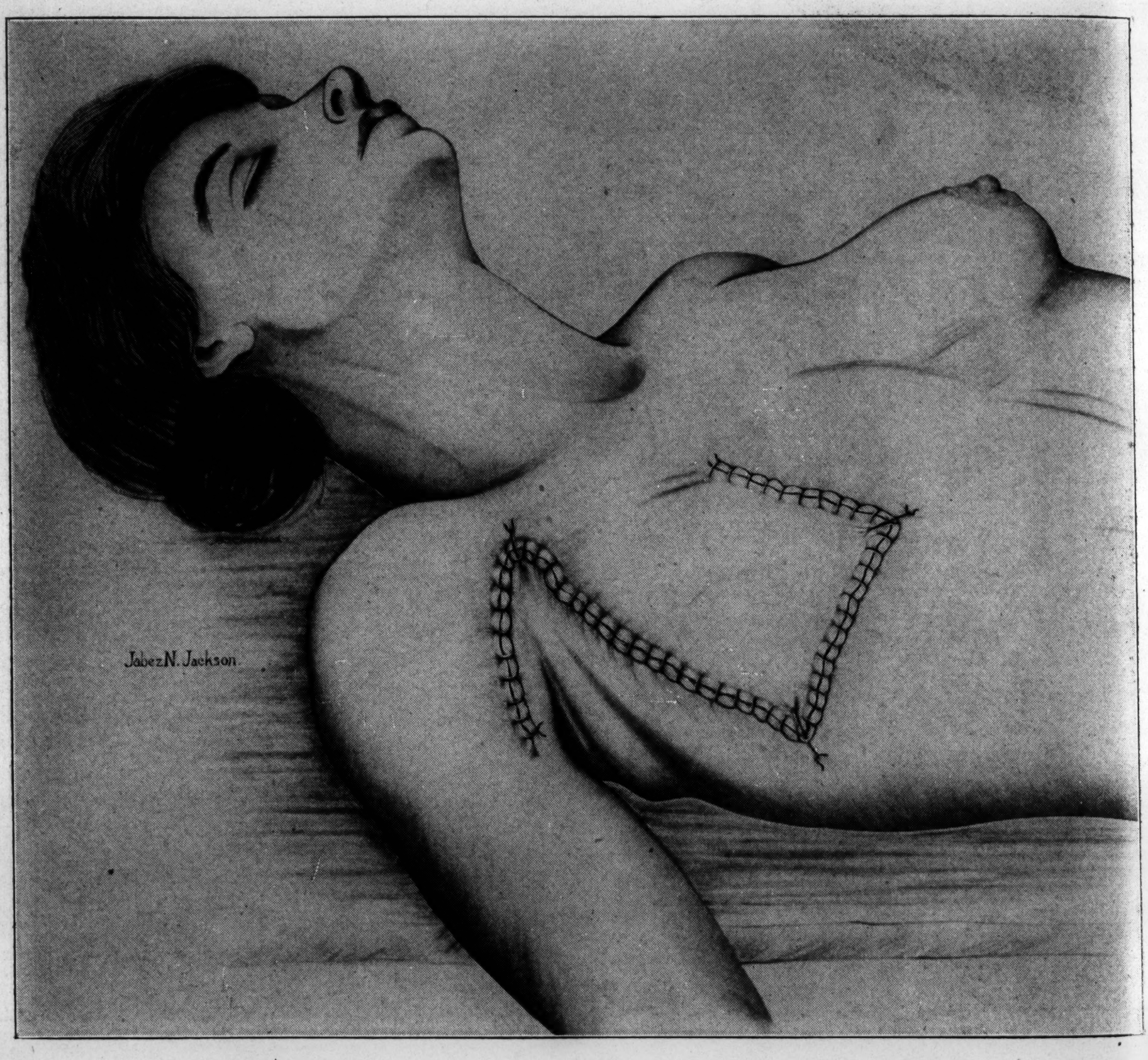


Fig. 9. Suturing complete. Tension sutures at the angles. Drainage in axillary.

sels and then removing the clamps. Thereafter we will have no trouble with hemorrhage from the axilla, excepting occasionally from little veins in the cellular tissue further back toward the scapula or toward the

chest. These incidental vessels, as a rule, will not be more than three or four in number, and we usually ligate them, likewise, immediately after clamping. Beginning thus at the apex and outer border of the axilla, fascia and glands are completely cleared by gauze and scissor dissection, working from the vessels inward toward the chest. As we complete this clearing of the deep axilla we usually complete our original skin



Fig. 10. Case 2. Picture taken two weeks after operation.

incision, carrying the horizontal incision over to the chest and marking the outer half of the ellipse so as to permit us to raise the flap and turn it upward toward the clavicle, giving a deeper exposure of the attachments of the pectoralis muscle above and in front. It is important that a small tenaculum forceps should be

placed at each angle of this flap when it is completed, as it will be of much service later on.

We now complete our dissection, usually with gauze, loosening up underneath the pectoralis muscles under the breast and toward the chest. The point of attachment of the pectoralis minor to the ribs is cut from underneath, flush with the ribs and the costal muscles. We likewise from underneath, loosen up the pectoralis major complete to its fixed points of origin from clavicle and sternum. While this is being done the breast is forcibly pulled back so as to give us exposure of the deep cavity of the wound. This muscle is now severed, from beneath, close to its points of bony at-

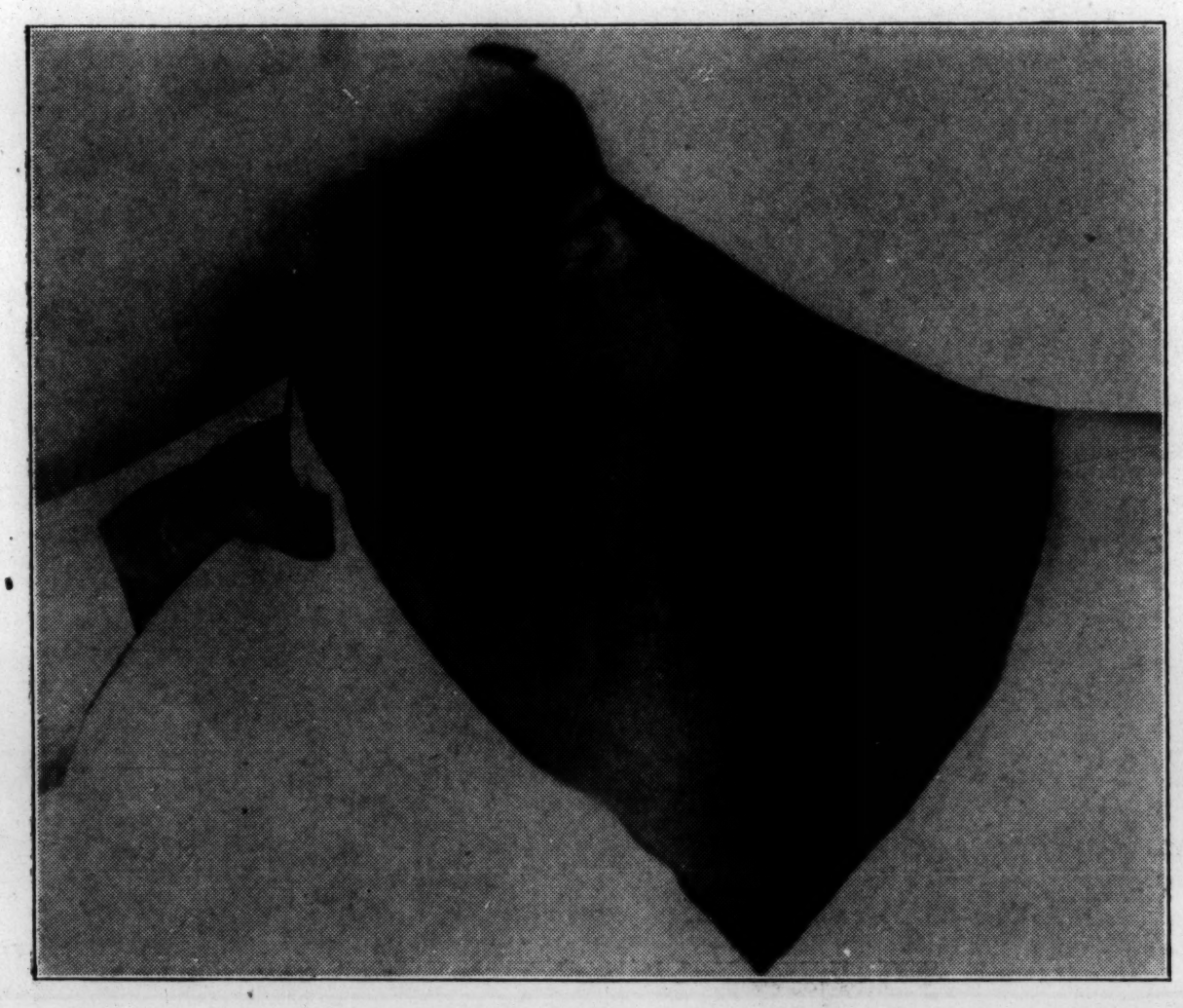


Fig. 11. Case 3. Picture taken four weeks after operation.

tachment, and the perforating branches of the internal mammary which supply the vascularity of the breast, are caught as soon as divided as they come through the chest wall. Usually there will be two or three of these vessels that will spurt, and that can be immediately caught with forceps, and later tied. After the

pectoralis major muscle has been entirely severed from beneath. the breast is allowed to drop back into its

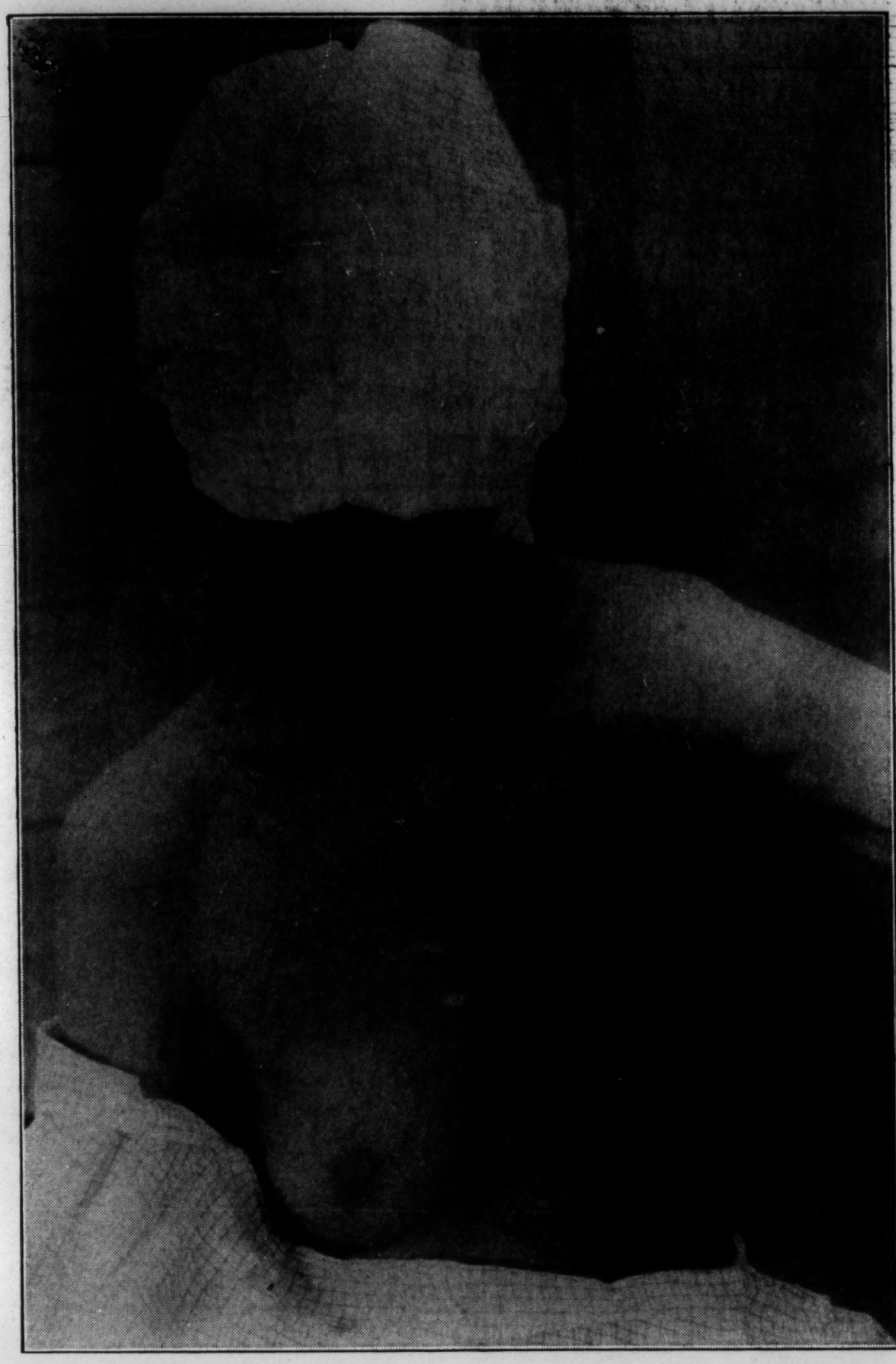


Fig. 12. Case 4. Picture taken two weeks after operation.

normal position, the skin incision is completed, and the breast, with the pectoral muscles underneath, is finally clearly removed. Branches of the mammary that were clamped are now tied, and the forceps removed.

Under these circumstances the skin incision practi-

cally does not bleed at all, and it will be noticed that we have not, at any time during the operation, had more than a half dozen clamps on the wound. As a matter of fact, the operation could easily be done complete with from one-half dozen to one dozen clamps, at the outside. This is made possible by the fact that all vessels are ligated, as trunks, at their points of origin, instead of having a large number of peripheral branches to deal with, as is usual in other operations. The extent of fascia dissected in this operation is the same as in any other thoroughly radical breast amputa-

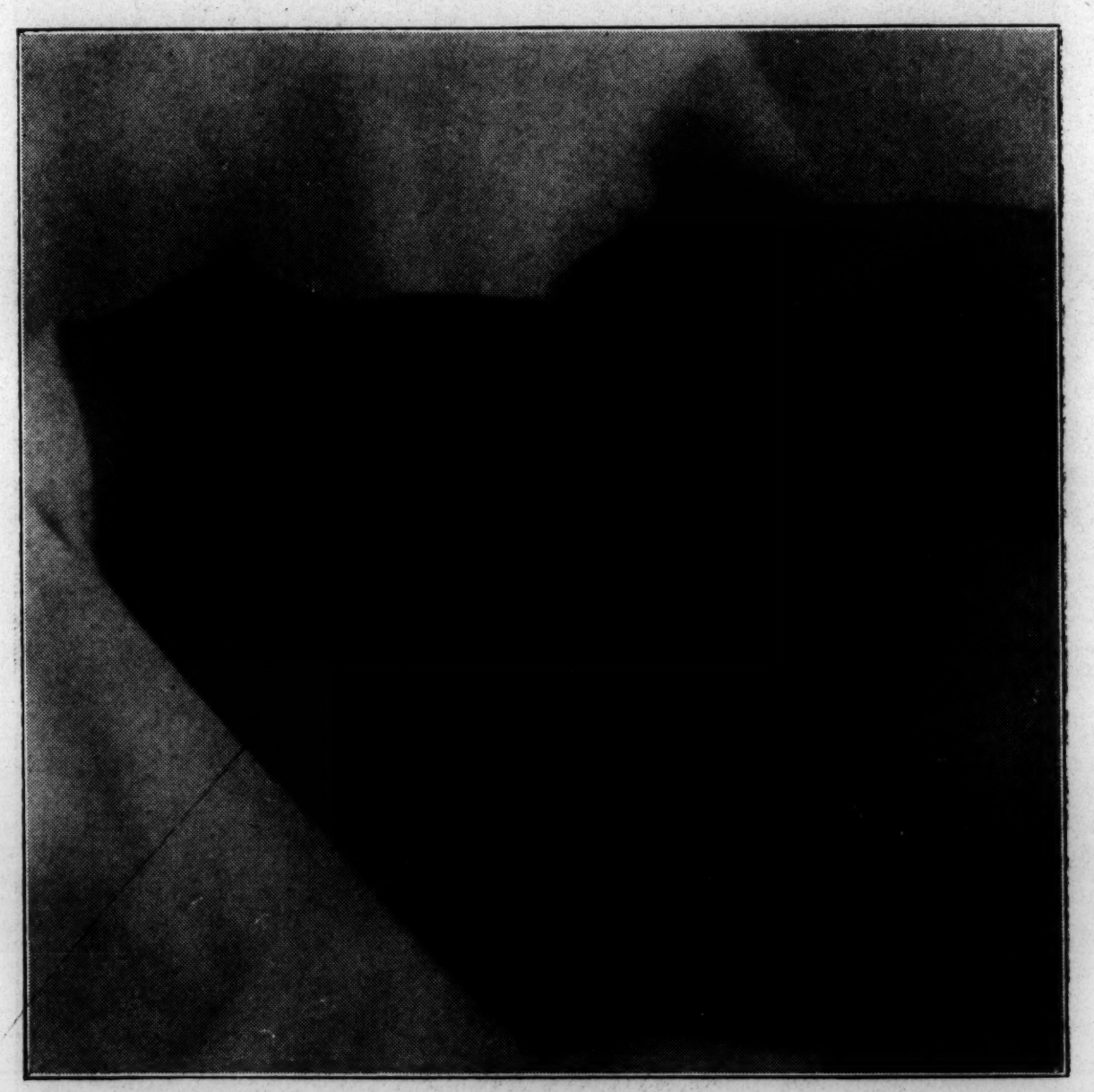


Fig. 13. Case 5. Picture taken three weeks after operation. This patient shown at session of Western Surgical and Gynecological Association.

tion. The removal of infected tissue now being complete, and the wound dry, our next concern is the placing of the flap and the closure of the wound, these also presenting points of distinct originality.

The quadrilateral flap of skin and superficial fascia which originally formed the anterior covering of the axilla is now stretched out by tenaculum forceps, and transferred inward to cover the defect of the chest-wall created by the removal of the skin of the breast, about the nipple. This flap, which is one of the distinctive features of the operation, will always contract



Fig. 14. Case 7. Picture taken four weeks after operation.

after it has been entirely loosened, and will look as though it could be of but little service. A couple of tenaculum forceps in the angles, with probably another pair on either side, will spread it out until it covers a rather surprising amount of space.

As the flap is now drawn over onto the chest, I usually fix it by attachment to the corresponding skin margin, as shown in Figs. 7 and 8. Another distinctive point now consists in catching up, with the tenacula, the margin of the lower portion of the pectoral fold, which represents the integument which formed the original floor of the axilla, and which in thin subjects is often very marked. The tenaculum on this margin is placed at such a distance from the lowest point of the first vertical line that when drawn upward it will bring this skin point up to the original beginning of the first incision beneath the clavicle. This maneuver brings the loose skin from the floor of the axilla closely up around the axillary vessels, and does away entirely with the axilla as a cavity in the subsequent anatomy of the individual. These tenacula likewise are usually clamped, and mark these fixed points of coaptation, as seen in Fig. 8.

I generally now place an approximation suture of silk-worm gut at these points, to steady my subsequent suturing. The remaining portion of the incision may be closed either with interrupted or continuous sutures, as desired, or, as I have frequently done, by the use of subcuticular sutures of silk-worm gut. It is most surprising, after this flap has been spread out and approximation properly made, how little tension there will be upon the suture line. Frequently the subcuticular stitches will suffice without the use of multiple sutures. A stab puncture in the lowest recesses of the wound space behind furnishes opportunity for drainage tube.

When the operation is completed it will be observed that we have an appearance which has been likened to that of a dipper, its handle running vertically along the inner border of the arm, paralleling the deltoid, and the bowl of the cup being represented by three lines, each at right angles to the other, on the chest-

wall. There is thus no opportunity for linear contraction to interfere with the function or utility of the arm.

This operation will be much better understood by the drawings which are presented herewith, and its advantages will be much more appreciated upon practical trial.

IN CONCLUSION

I believe that this method has the following advantages:

1. The flap forms a covering for the chest defect, as a rule, without any tension, and thus almost entirely obviates the necessity of grafting, which is so frequent in other methods. In fact, I have not found any case, operated on by my method, that required grafting Of course, this is not intended to cover cases where there has been extensive previous ulceration, or where we cannot get healthy tissue for a flap of any character.

2. The drawing of the skin up to the arm does away with the fossa axillarius, and thus with the large space which nature would have to obliterate by the formation of scar tissue, with the resultant pressure upon the axillary vessels and nerves.

These first points are the ones which would probably be most striking to one who has not seen the operation.

3. The ligation of all vessels at their nearest point of origin does away with the use of a large number of hemostatic forceps, which cause loss of time, to say nothing of the inconvenience of having a large number of instruments in one's way. I have in no instance used more than one dozen forceps in this operation, and can usually do the work with about six. The operation is thus shortened, so that, as a rule, I find that to complete it requires from forty minutes to one hour or thereabouts. In fact, personally I have never run

beyond an hour, even doing the operation slowly, as I have in most cases, for the purpose of demonstrating this new technic. I have done the operation in a period of time as short as forty minutes.

4. The most noticeable feature to the on-looker, when the operation is done in the manner described, probably is the marked absence of hemorrhage, so that it can almost be called a bloodless operation.

5. The entire technical portion of the operation is completed before the chest is exposed by removal of the breast; therefore long exposure of an enormous area of raw chest surface, with the attendant shock, is done away with. As soon, in fact, as the breast is removed. we are ready to close the wound.

DISCUSSION

Dr. Charles A. Powers, of Denver, Colo.—I judge that the key to this procedure of Dr. Jackson's lies in the flap which covers the large skin defect, and as such it appeals to me. The amount of top tissue removed is the same as that in the operations with which we are familiar.

I would like to ask Dr. Jackson whether in any of these cases there has been sloughing at the corners of this quadrilateral flap?

Personally, I have been very much pleased with the procedure of Dr. J. Collins Warren, of Boston, with which you are all doubtless familiar, namely, that of bringing up a flap from the side of the chest.

Dr. Jackson (closing the discussion).—In answer to the question of Dr. Powers, I have in some instances had slight sloughing at the corners of the flap. I have had also in one or two cases a very slight slough, usually not more than a line in length, at this point here (referring to diagram). That is the only point where I have not obtained primary union. In recent cases I have put in a wide Halsted mattress suture for tension, and then I got union without sloughing. In the first cases I had some difficulty in bringing the edges together, and there was a slight slough, but the parts have closed without any trouble.

TUBERCULOSIS OF THE CERVICAL LYMPH NODES

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CHICAGO, ILLINOIS

Although this subject would seem at first glance to be one with which every surgeon is thoroughly familiar, I feel that the progress made even in this subject during the past decade would warrant one to bring it before this Association.

Our knowledge of the etiology, diagnosis, and treatment of this condition has advanced so much that I will consider it chiefly from these standpoints.

ETIOLOGY

It has been known, in a more or less empirical manner, for many years that the tonsils were the most frequent portal of infection in tuberculosis of the cervical lymph nodes. The more exact researches of recent times have demonstrated this fact beyond a doubt. In ten per cent of a large number of tonsils and adenoids removed during life evidences of tuberculosis have been found. The majority of these examinations were tonsils and adenoids removed from children. If one considers that in many of these cases the tubercular lesion might have been healed at the time of operation the percentage of cases in which tuberculosis was found is smaller than is actually the case. Whether these foci are primary or secondary it is impossible to say during life, but it would be fair to assume that they are primary in many cases.

The plates illustrating this paper were loaned through the courtesy of Surgery, Gynecology, and Obstetrics.

The best manner in which to explain the frequent involvement of the lymphoid tissue of the tonsils and pharynx, with transmission of the infection to the cervical lymph nodes, is that young children inhale the dust which contains the bacilli in crawling about on the floor, and that they lodge in the tonsils. The organisms may remain latent in the cervical lymph nodes for years and then suddenly start up actively. Those who are interested will find an excellent review of the literature of the portals of infections in cervical lymph node tuberculosis, in the articles of Lartigau and Nicoll,[1] of Koplik,[2] and of Kingsford.[3] This condition of tonsillar tuberculosis is, of course, most frequent in children, but may exist in adult life.

If I were to enumerate the various portals of entry according to their frequency in tuberculosis of the cervical lymph nodes (Fig. 1). I should say:

First. The faucial tonsils.

Second. The pharyngeal tonsils or adenoids.

Third. The temporal bone in a tubercular condition with resultant otitis media.

Fourth. Carious teeth.

Fifth. Tubercular lesions of the buccal and nasal mucous membranes.

The last named is so rare that it may be left out of consideration. The third is so self-evident that its recognition clinically is easy. The fourth (carious teeth) form the atrium in a small proportion of cases.

I believe that we are apt to overlook the importance of the first and second (tonsils and adenoids) of these atria in our treatment of tuberculous cervical lymph nodes.

We can do much to prevent such a secondary condition through the enforcement of the same principles as are applied in the prevention of pulmonary tuberculosis. These are referred to under the head of treatment.

George B. Wood[4] has recently confirmed some of the above views by injecting colored fluids into the faucial tonsil. He found that it passed through the peritonsillar lymphatics into a node which he terms the tonsillar (one of the deep cervical group), situated in the angle between the internal and anterior jugular veins (Fig. 1).

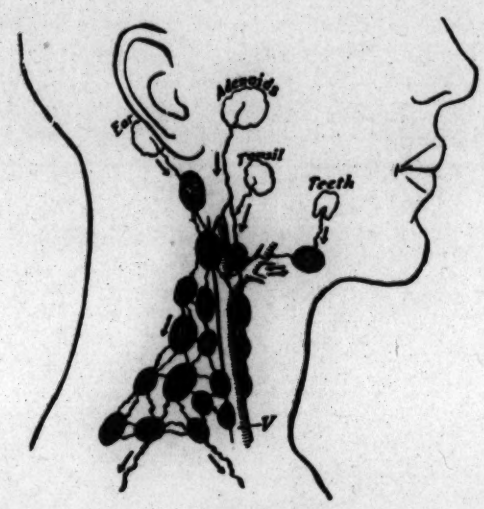


Fig. 1.

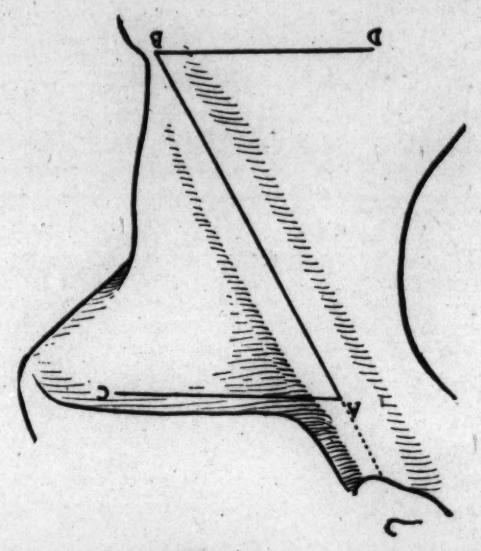


Fig. 2.

Fig. 1. Portals of infection and the most frequent nodes involved in tuberculosis of the cervical lymph-nodes. The arrows show the direction of the efferent lymph-vessels leading from the various portals of infection toward the respective nodes which are first infected. M. Uppermost node of internal jugular vein which receives the infective material from the ear. T. Tonsillar gland located in angle of internal jugular and anterior jugular. This receives the lymph from the tonsil. From J downward are to be seen the principal lymph-nodes of the neck, which receive the lymph from the head and face. These are the internal jugular group lying beneath the sternocleidomastoid muscle, in close relation to the internal jugular vein V, and in direct connection with the lymph-nodes of the posterior triangle of the neck, P. S. Submaxillary nodes. These lie either upon or within the capsule of the submaxillary salivary gland, and receive the infective material from the teeth and jaws, but, in the author's opinion, may be infected by retrograde currents from the tonsillar lymph-nodes. C. Two nodes are shown with their short venous branch leading into the internal jugular. Attention is called in the text to this condition, under operative technic.

Fig. 2. Incisions employed in the extirpation of tubercular cervical lymph-nodes. The typical incision is from A to B, over the middle of the sternocleidomastoid. If it become necessary to make an extensive dissection of the submaxillary region, the incision extends from A to C. If a large exposure of the supraclavicular region be necessary, the incision is extended in the direction B D.

Personally, I have made it a practice to have every case examined, if possible, before operation by a specialist, as to the existence of diseased faucial tonsils, complicated or not, by the presence of adenoids.

It may be of interest to relate an instructive experience in this connection. I operated upon a boy

of ten for tubercular cervical nodes, without paying any attention to the condition of the upper respiratory tract. At the time of the first operation I considered that I had been very thorough in removing every palpable node with the surrounding fat. (I shall refer later to the importance of removing this fatty tissue.) He returned one year later with almost as many enlarged nodes as I found at the time of the first operation. I advised and performed a second extirpation, combined with the removal of adenoids and enlarged tonsils. No recurrence has taken place up to the present time, about five years after the second operation.

I do not believe that sufficient attention has been paid to removing these primary atria, and at the present time I do not consider an operation thorough, especially in children, without such an examination of the nose and throat. The removal of the tonsils and adenoids is now combined with the extirpation of the lymph nodes as a more or less routine measure.

DIAGNOSIS

Our notion of tubercular enlargements of lymph nodes has generally been that they occur in a chronic form only, and that the entire course of the disease was one which extended over a period of months to years. There seems to be no question that there are cases which run a very acute course, so that caseation occurs within two to three weeks after the onset of the disease. The following case illustrates this point:

During the past two or three winters we have had in Chicago an epidemic of acute enlargement of the cervical lymph nodes on both sides of the neck, accompanied by rise of temperature and local inflammatory signs. In some of the cases the temperature would be persistently high, varying between 101 and 104 degrees for a period of two to three weeks, so that one was often in doubt as to the possibility of suppura-

tion having occurred. The majority of these cases are, no doubt, the result of an influenzal inflammation of the lymph nodes, a disease which was described in 1896 by Pfeiffer as a complication of influenza, and called Pfeiffer's disease or granular fever.

During the past and present winters I have had occasion to see a large number of these cases in consultation, and two of them have interested me greatly. One, a schoolboy of fifteen, had an acute bilateral enlargement, involving many of the internal jugular nodes. One of them showed distinct fluctuation about

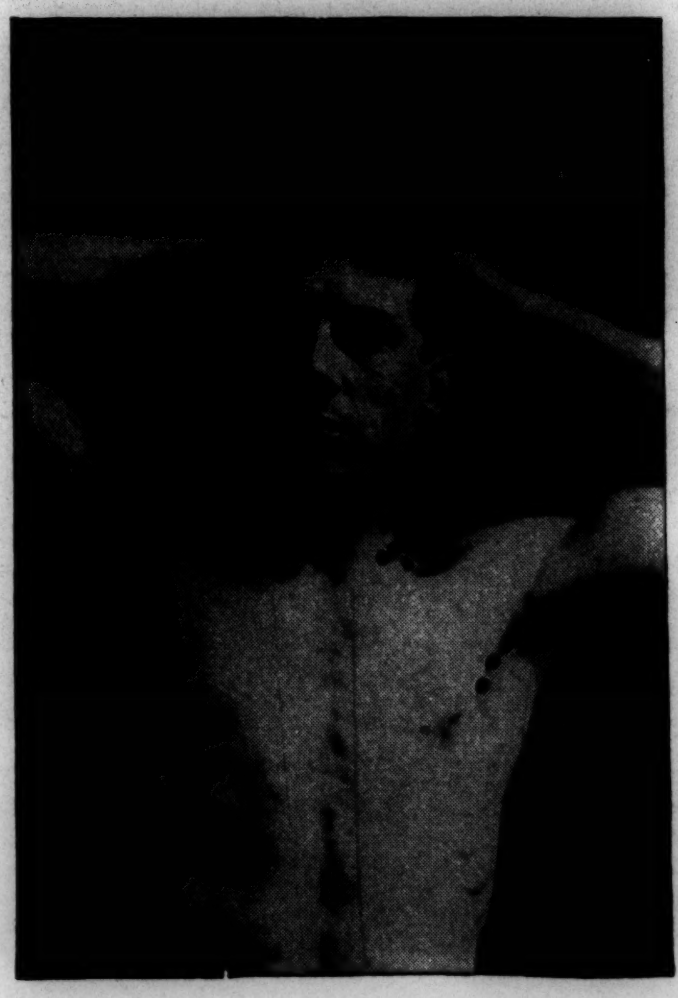


Fig. 3. Distribution of enlarged lymph-nodes in the case of pseudoleukemic form of tubercular lymph-nodes. (See text.)

five weeks after the onset of the disease. I evacuated typical cheesy pus. A radical extirpation of the nodes was undertaken, and revealed the presence of a very extensive involvement of many nodes along the internal jugular. This case had begun acutely, unlike a tubercular form, with a temperature of 102°, and all of the signs of the ordinary Pfeiffer fever.

I saw a second case, in a woman of thirty, with

caseation of the glands in three weeks. In neither of the cases was there any history of previous tubercular disease of the patients themselves, or in the family. The glands were from the first much harder than in Pfeiffer disease.

There is another condition which must be considered in the differential diagnosis. These are cases

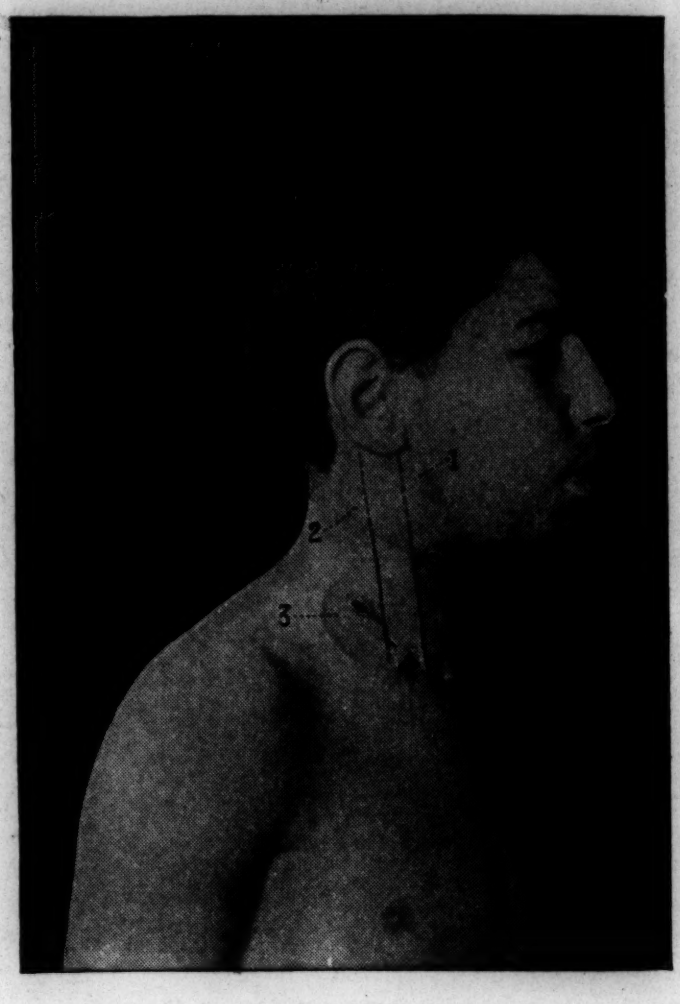


Fig. 4. The relation of tubercular glands of the neck to the sternocleidomastoid muscle. 1. Several large glands, which are fused together, lying in front of the muscle, extending as far forward as the angle of the jaw. The black area at the lower level of this mass indicates a sinus covered with tuberculosis granulation tissue. 2. A similar mass situated in the upper portion of the posterior cervical or occipital triangle, between the upper ends of the sternocleidomastoid and trapezius muscles. The sternoclidomastoid muscle usually lies superficial to such glandular masses, the latter being adherent to the deep vessels. 3. Mass of glands at lower portion of posterior cervical triangle (subclavian triangle). The black area at the center of this mass is a sinus similar to the one in relation to the other glands. 4. Outlines of sternocleidomastoid muscle.

to which Fisher has called attention, and termed the pseudoleukemic form of tubercular lymph nodes. There is an enlargement not only of the cervical nodes, but of the axillary and inguinal as well. The enlargement takes place gradually, and there is no tendency to softening as in ordinary tubercular nodes; or to

the formation of adhesions between the adjacent ones.

The entire clinical picture resembles greatly that of Hodgkin's disease, but differs from it in the fact that the enlargement of the nodes is not as progressive as in pseudoleukemia, and rarely reaches the enormous size of the latter, nor is there any involvement of the mediastinal nodes. Figs. 2 and 3 illustrate this variety of enlargement whose exact nature is not quite clear.



Fig 5. Drooping of right side of neck as a result of paralysis of the trapezius muscle, following severing of the spinal accessory nerve.

In one of these patients a number of typical tubercular nodes were extirpated on the left side of the neck, three years ago. About one year after the wound had been healed, the patient presented himself on account of a recurrent enlargement of the nodes on both sides of the neck and in the axillæ. The examination showed a condition which it was practically impossible to differentiate from an incipient Hodgkin's disease, and if it had not been for the absolutely reliable history obtained, it would have been impossible to make a diagnosis.

In the second case the enlargement of the lymph

nodes was very marked on both sides of the neck and in the axillæ, as well as in the inguinal region. In this case, three years before, Dr. A. E. Halstead had removed a large number of typical tubercular nodes. There has been no tendency to breaking down, and under the influence of the *x*-ray a very marked improvement has occurred.

I have referred to these acute and pseudoleukemic forms in order that further observations may be made. I need only briefly mention the other forms of lymph-node enlargements from which the tubercular must be differentiated. They are the true Hodgkin's or pseudoleukemic, the syphilitic, lymphatic leukemia, chronic non-tubercular hyperplastic nodes, lymphosarcoma, and secondary carcinomatous.

TREATMENT

Prophylactic.—We can accomplish much by educating the masses in the knowledge of the general principles of hygiene. Those suffering from pulmonary tuberculosis must be cautioned not to expectorate on floors of public conveyances, since the pulverized sputum is often first arrested in the tonsils and other lymphoid tissue of children and young adults. Both poor and rich must be taught the necessity of cleanliness in the modern sense of the word. A free circulation of air in living, and especially in sleeping apartments, will do much to keep the tonsillar ring in a good eliminating condition. I am firmly of the opinion that we can accomplish good through early and radical removal of diseased tonsils, and of adenoids when found, since these are the most frequent atria of infection.

Non-operative Treatment.—If an operation is deemed inadvisable or is objected to, the ideal treatment is to send the patients to the mountains or to the seashore. If it is found impossible to follow such a plan, the use of tonics, cod liver oil, guaiacol, and

iodide of iron is of aid, provided that the process is not a very active one. If the latter exists no medical treatment will be of much avail. I do not believe that the external use of iodine is of any benefit.

In regard to the *x*-ray I am frank to say that my experience does not warrant an expression of opinion.

Operative Treatment.—A study of the statistics of various authors will convince one that a thorough and radical extirpation of every enlarged tuberculous node will give the best prospect not only of immediate immunity, but also of freedom of development of foci in

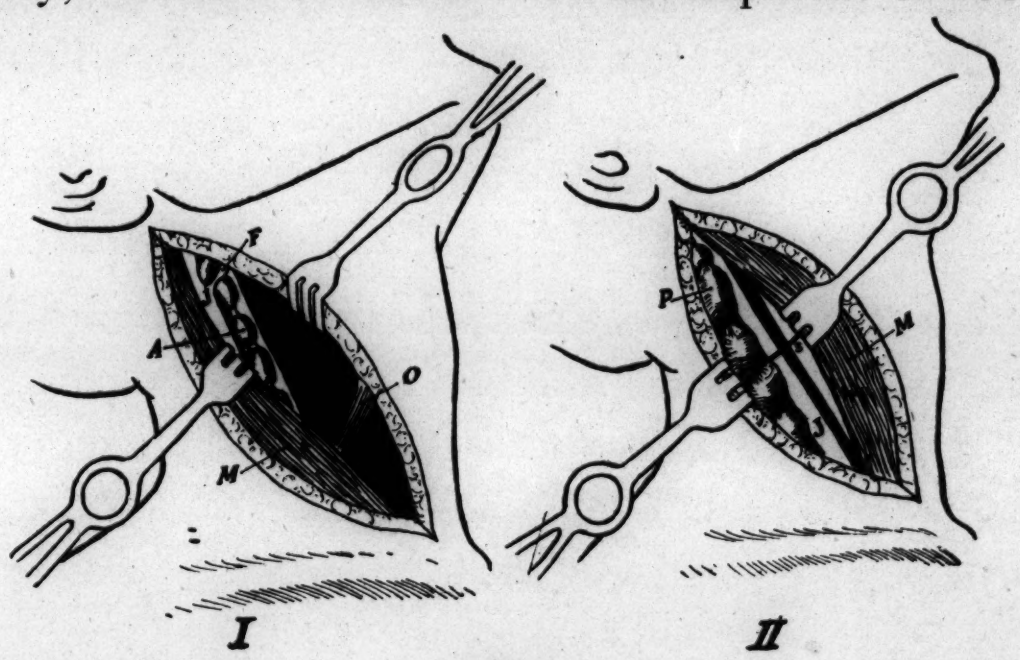


Fig. 6.

Fig. 6. I. Exposure of internal jugular lymph-nodes A, in upper half of neck, by retraction of the sternocleidomastoid muscle; M upwards. F. Anterior jugular vein. J. Internal jugular vein. The lymph-nodes are shown attached both to the carotid artery (shown in white) and to the internal jugular vein. O. Omohyoid muscle. II. Exposure of lymph-nodes in posterior triangle by retraction of sternocleidomastoid muscle (M) forwards. S. This latter is placed just below the point of emergence of the spinal accessory nerve from the middle of the muscle. J. Internal jugular vein, to which a large number of lymph-nodes are shown adherent.

the lungs, bones, peritoneum, kidney and testis at some period in the future.

What do statistics of operative interference show? In 745 cases collected by Blos from eleven sources, over 54 per cent showed permanent recovery. Six years was regarded as ample time after operation to be considered a permanent result. Of 140 cases collected by Jordan, 20 showed involvement of the lung before operation, and at a later examination 16 of these were well and free from pulmonary disease. Of

the 58 cases (out of a total of 143 operated upon) collected by Mitchell, 45, or 77.6 per cent, were well with no local or other recurrence, and with negative lungs, after periods varying from one to 13 years.

I agree with the opinion of Dowd,[5] that, if the nodes are thoroughly extirpated, there is no recurrence in 75 per cent of the cases and ultimate recovery in 90 per cent. Both of these can be even increased by the systematic removal of the tonsils and adenoids at the time of the lymph node extirpation.

Method of Extirpation.—I will describe briefly the method uniformly employed in 50 cases. If tonsils or adenoids are to be removed this operation is performed after the extirpation of the nodes, in order not to infect the field of operation.

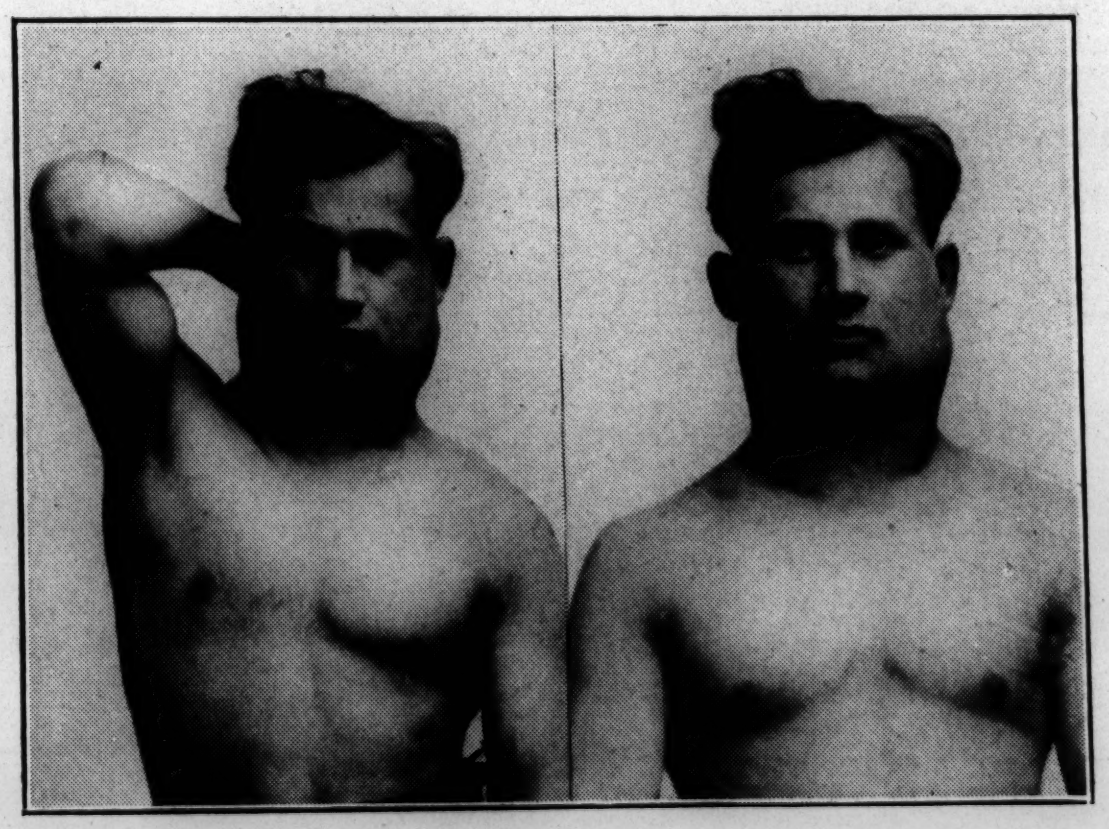
The patient lies flat upon his or her back, the shoulders are raised by a small sand-bag so that the head falls back. The chin is turned to the side opposite to that upon which the incision is to be made.

Of all the different forms of incision I prefer the one shown in Fig. 4, if a large number of nodes are to be extirpated. I have never found that the transverse incision, as recommended by Dowd, gave the exposure of the deeper structures which a longitudinal one does. The latter is made over the middle of the sternocleido mastoid and can be extended at its upper and lower ends in an anterior and posterior direction to remove nodes in the submaxillary and supraclavicular regions, respectively.

If sinuses exist (Fig. 5) their walls are curetted, and the skin edges extirpated. If a large abscess is present I prefer to open it under Schleich anesthesia a few days to a week before the radical extirpation, in order to avoid an infection of the entire operative field with tubercle bacilli. The radical operation begins with the above longitudinal incision carried through the skin and deep fascia until the anterior

border of the sternomastoid muscle is exposed. This is always the first landmark, and by adhering to the routine of following the anterior and posterior borders of this muscle much time will be gained in getting one's bearings, so to speak, as to the relation of the enlarged nodes to the principal vessels and nerves.

The deep cervical fascia is thoroughly divided with a scalpel and the sternomastoid muscle freed along both of its borders. Great care is taken to catch every bleeding point at once. The majority of the superficial, and many of the deeper, vessels require no ligature, the exception being the external jugular vein, which it is impossible to avoid severing. When the edges of the wound are well retracted, the extirpation proper is begun by catching the node either with an artery forceps, or, better still, with a sharp-pointed, short-tined retractor, and traction made upon it and the node drawn toward the surface. I have



Figs. 7 and 8.

Figs. 7 and 8. Pseudoleukemic form of tuberculosis lymph-nodes.

found a blunt-pointed, short-bladed curved scissors far better than a Kocher dissector. One can work the node loose from its adherent surrounding tissue and at the same time cut toward the capsule in separating

these adhesions without constantly changing instruments. I never employ a scalpel after the sternomastoid borders have been exposed. If the nodes are adherent to the internal or anterior jugular or to the carotid no accident ought ever to happen if the above described combined traction, blunt dissection, and an occasional cut of the capsule are employed. I have repeatedly exposed the internal jugular from chin to clavicle without ever having injured it. It is of great importance not to pull a node away from the jugular, and then to cut between. If one does, the jugular, being very elastic, is pulled out and easily wounded. By inserting the blunt scissors between the vein and the node the latter can be easily stripped from the vein-wall.

One will encounter some obstinate bleeding from arteries and veins which supply the nodes themselves. In Fig. 6 I have shown a condition to which Leaf has called attention, and which I have myself occasionally encountered. A node that is adherent to the internal jugular will have a short, wide vein emptying directly into the jugular. It is impossible to avoid cutting this communication, and the hemorrhage may be so severe as to cause one to think that the main vessel has been cut. If this branch is too short to be ligated it is best to transfix the wall of the jugular with a non-cutting needle armed with catgut, and thus by applying a parietal ligature check the hemorrhage.

The upper set of deep cervical nodes are best extirpated by pulling the muscle backwards (Fig. 6), and the lower, including those lying in the posterior triangle of the neck, by pulling the muscle forwards (Fig. 6).

The position of the spinal accessory nerve must always be borne in mind. It emerges from the sternomastoid at its middle, and passes almost transversely across the posterior triangle to enter the trapezius.

It is often embedded in the midst of enlarged nodes, and is easily severed in enucleating them at this point. I have often identified it by pinching it lightly with an artery forceps and then watched the trapezius muscle contract. When severed the patient is unable to raise the injured shoulder (Fig. 5) as high as the normal, but this can be compensated for in course of time.

On the left side one must bear in mind the position of the thoracic duct. I cut this recently in one case which had been previously operated upon by another surgeon so that extensive cicatricial tissue existed. At the first dressing a considerable amount of thin milky fluid escaped, but by packing the wound firmly this ceased within a week. This treatment is usually effective, suture being seldom required. In the majority of cases of injury of the thoracic duct so far reported, only one of the main branches has been wounded, so that packing the wound tightly usually suffices. A thorough removal of all fat will be of great aid in preventing recurrence.

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THE FREE INTERVAL IN MENINGEAL HEMORRHAGE

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Case 1.—Trauma, slight concussion; exact length of free interval unknown. Retired for night, apparently well, five hours after accident. Found dead in the morning. Autopsy revealed a fissure fracture of the parietal bone, lambdoid, and occipitomastoid sutures, along the groove for the lateral sinus to the foramen lacerum posterius. No depression, but a large extradural clot.

Mr. S., aged 38, American, a freight-brakeman, while engaged in tightening a brake on a box-car, slipped and fell to the track. He alighted upon his head and shoulder, but arose immediately; he was somewhat stunned, and sat down. After the lapse of about ten minutes, he felt better and wanted to resume his work. but this the conductor would not allow him to do. He was advised to consult a doctor, but instead of doing so, went to his boarding house.

The accident occurred at 3 P. M., and the victim retired about 8 P. M., feeling fairly well, having merely a slight headache. At about 10 o'clock in the evening a friend went to the door of his room and knocked, but, receiving no answer, took it for granted that the occupant was asleep, and went away. In the morning the brakeman was found dead in bed.

Autopsy, in the presence of Drs. Jeannotte, Boyd, and McDonald of Leadville, November 28, 1902, revealed the following: scalp intact; a depression an

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The plates illustrating this paper were loaned through the courtesy of Surgery, Gynecology, and Obstetrics.

eighth of an inch deep, three inches long, and half an inch wide was to be seen in the right occipitoparietal region, which extended from an inch posterior to the mastoid process, upward and toward the median line. This area was dark at the center, and presented the appearance of having come into forcible contact with a blunt object.

Upon dissecting back the scalp, a large amount of extravasated blood was found in the region underlying the depression of the skin. This area of ecchymosis in the subcutaneous tissue was about four inches in diameter.

A linear fracture was found to extend from below the mastoid process in an upward direction for about four inches, three inches of which being in the occipitomastoid and the lambdoid sutures and the last inch in the parietal bone, extending forward and toward the center of the vertex. There was absolutely no depression.

Upon removing the calvarium, an extradural clot was found, 3 by 3 inches by 1 inch, located in the right occipitoparietal region. This clot was bounded anteriorly and externally by the posterior surface of the petrous portion of the temporal bone and the tentorium cerebelli; posteriorly and externally by the parietal and occipital bones; and internally by the dura mater.

After removing the clot the line of fracture could be seen to extend along the groove for the lateral sinus to the foramen lacerum posterius. The lateral sinus was torn. The dura was intact; the cerebrum and cerebellum appeared normal.

Case 2.—Trauma, concussion five minutes, free interval two hours. Irritability, restlessness, paralysis of right arm, and increasing somnolence. Operation three hours after accident. Y-shaped fracture of parietal bone with depression, extending toward the base. Extradural clot, from posterior branch of middle me-

ningeal. Elevation of depression, removal of blood, gauze packing, recovery.

C. H., aged 28, American, laborer. Fell from a scaffold about ten feet high, alighted upon head. Was unconscious for about five minutes, then arose and walked. Complained of severe pain in head.

Patient was taken to St. Vincent's Hospital, where his sole complaint was headache, with tenderness over left parietal eminence.

Examination one hour after accident revealed no



Fig. 1. Specimen from Case 1.

focal or general pressure symptoms. Over the left parietal eminence there was a diffused doughy swelling, about two and a half inches in diameter. Pressure or percussion over this area caused severe pain.

The patient was put to bed with an ice-cap to head and given magnesium sulphate, one ounce. During the first hour he was quite restless, continually tossed about, and complained of headache. The motion of

extremities was the same on both sides, and he seemed perfectly rational.

At the beginning of the second hour in hospital, third after the accident, the nurse, who had been instructed to watch him very carefully, noted that he moved the left arm more than he did the right.

During the second hour he became more quiet, and sank into a deep, apparently normal, sleep, from which

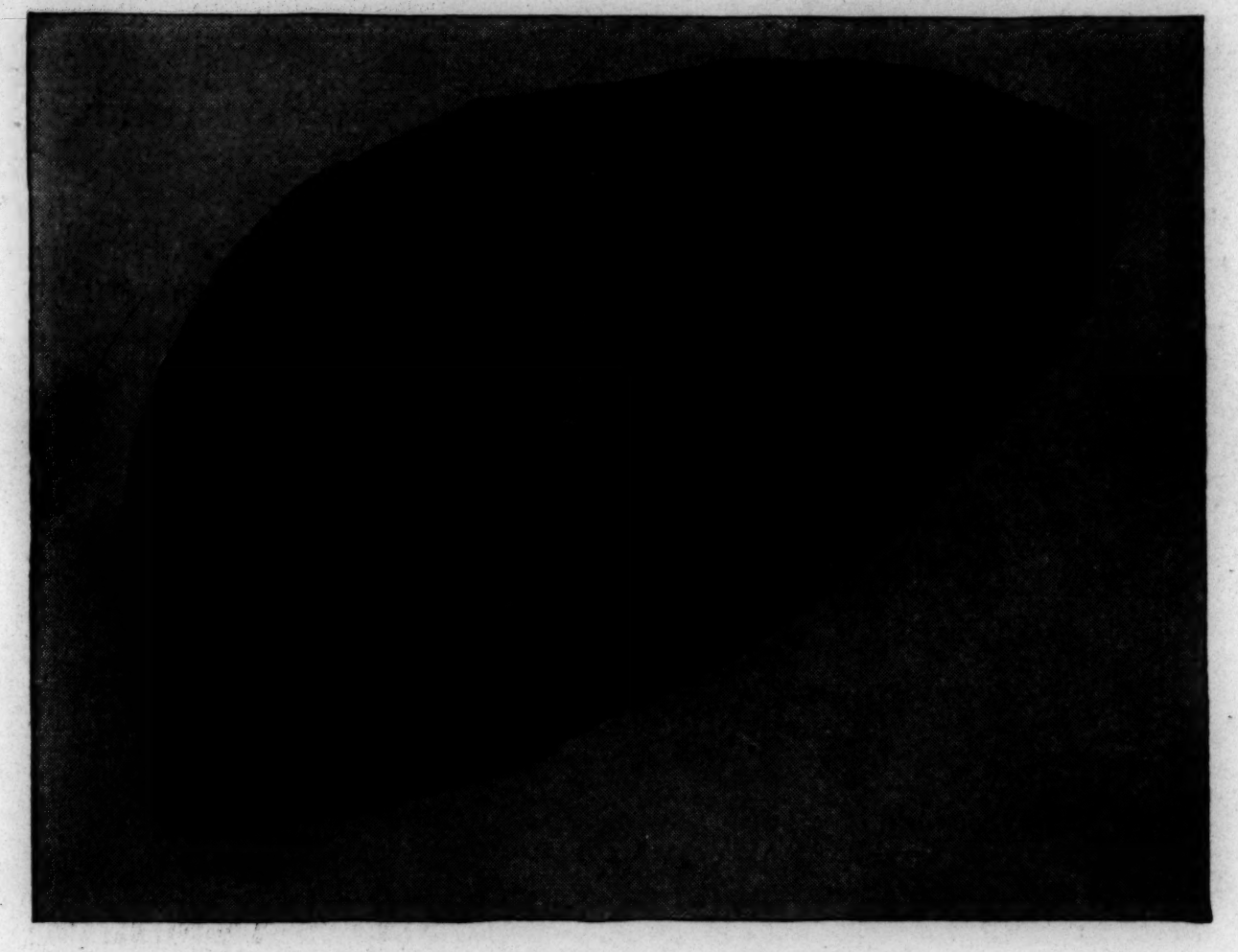


Fig. 2. Calvarium from Case 1.

he could be aroused only with difficulty. At this time I again saw the patient, and there was a distinct paralysis of the right arm; the reflexes were present and normal; the face and pupils were normal. He could not be fully awakened, and his speech was merely an incoherent mumble.

Operation three hours after the injury. A few whiffs of chloroform were administered by Dr. Gregersen. Dr. Jeannotte assisted. An omega-shaped skin incision was made over the area of swelling and contusion, and revealed a comminuted, Y-shaped fracture of the parietal bone. The fragment forming

the apex of the V was depressed. Upon elevating this depression, blood escaped. With rongeur forceps the opening in the skull was enlarged toward the base, following the line of fracture. The blood was removed with blunt instrument and a stream of normal salt solution. The dura was intact and was not incised. The source of the bleeding was not located; the wound was packed with gauze. The paralysis of the arm had disappeared the next day, and the patient made an uninterrupted recovery. The bleeding was evidently from the posterior branch of the middle meningeal artery.

Case 2 is typical and quite usual. Case 1, on the other hand, while not very rare, is still rather uncommon. In 80 cases studied by the writer, only two similar instances were encountered.

The discrepancy in the length of the latent period in these two instances, and the tragic result of its presence in one, led to a study of this "free interval," which was based upon cases taken from available literature, the result of which is here appended.

DEFINITION

By "free interval" is meant a practically symptomless period of consciousness, which follows a primary transitory unconsciousness, and precedes a secondary increasing and permanent loss of consciousness, this condition being usually found in association with a head injury.

ETIOLOGY

The cause of the bleeding will, in the vast majority of cases, be traumatism, but may be spontaneous.

Boreau reports a case of hemorrhage following anesthesia with chloroform, and considers the chloroform as the cause. But as the operation was performed for a sarcoma of the forehead, it is possible that the pathological condition, or the trauma of operation, might have been more of a causative factor than the anes-

thesia. The patient recovered in this instance; so the exact condition was not known.

Whooping-cough may serve as a cause, which might be classed as indirectly traumatic. Townsend collected twelve cases due to this cause, and the literature has been added to by Brown and by Loevy.

The traumatism of delivery has frequently been found to cause meningeal hemorrhage. Richardière and many others have noted this, and in 1901 Wilson considered the subject of intracranial hemorrhage in the new-born at length, but under treatment did not mention surgical intervention. W. W. Keen criticised this omission, and stated that at the very first opportunity he intended to operate and remove the clot, the cause of the pressure in these cases. He and Dr. S. Weir Mitchell having had the advisability of such an operation under consideration for some time. In 1905, Cushing reports a number of cases of this character in which he had operated.

With direct traumatism there is usually a fracture of the skull, but fracture is by no means a constant accompaniment of meningeal hemorrhage. Numerous cases with no fracture have been reported. In 78 cases reviewed in this study, 46 were complicated by fracture, and in 32 cases there was no fracture of the skull.

Intracranial hemorrhage may be divided into (a) meningeal; and (b) cerebral.

Cerebral hemorrhage, when traumatic, is practically always associated with contusion and laceration of the brain, and only exceptionally is there a free interval.

Meningeal hemorrhage may be divided into (1) extradural; and (2) subdural.

1. In extradural hemorrhage, the blood is situated between the dura and the skull; it arises from the middle meningeal artery, the dural sinuses, or, rarely, from the diploic vessels.

2. In subdural hemorrhage, the hematoma is located between the dura and the brain. With a tear in the dura, it may be continuous with an extradural clot. With an intact membrane, it may arise from the meningeal artery, the sinuses, the pial vessels, or from a hemorrhagic pachymeningitis.

Subdural accumulations of blood may occur independently of bleeding from the meninges, as in cases of laceration of the brain, in which the terminal branches of the middle cerebral are the source.

The frequency with which intracranial hemorrhage complicates head injuries may be seen from the statistics of Phelps, who found in 193 autopsies hemorrhage in 181 cases; extradural, 54 times; subdural, 69 times; and cerebral, 58 times. He states that in from fifty to sixty per cent of cases, hemorrhage becomes an important element, and in an eighth of all cases it is the direct cause of death.

As to the cause of the free interval itself, there have been presented numerous explanations. The more common and generally accepted reasons offered for the occurrence of this latent period are such as:—

1. The time in which the dura is being separated from the skull. Sir Charles Bell, in 1816, found that the dura was intimately attached to the inner surface of the skull, and that a blow or a fracture caused a separation of these structures, in this way forming a space in which the blood could accumulate, and as this mass of blood increased in size, its force became greater, and more dura was detached. In this manner large clots were formed, and finally pressure symptoms appeared. On the other hand, most anatomists, notably Marchand and Tillaux, found the dura loosely attached to the inner surface of the skull, except at the sutures, the foramina, and the tentorium. In the temporal region Marchand describes the dura as being easily separable, and has called this area the "zona decollable," meaning the zone of separation. In infants

the dura is much more intimately adherent to the skull, hence the comparative infrequency of extradural clots in meningeal hemorrhage of the new-born.

In accordance with this theory, there is a high arterial pressure in the middle meningeal artery, with an injury of that vessel; a much lower intracranial tension, compressibility of the cranial contents, and a separable dura. These are the elements necessary for the formation of an extradural clot, and while the clot is forming, we have the free interval.

As showing that there may be a free interval under circumstances dissimilar to the above, the case of Da Costa is instructive. Incision revealed a fracture, with hemorrhage from the sinus; bleeding was controlled by gauze packing, and the patient did nicely for a number of days, but on the tenth became violently insane. A piece of gauze twelve inches long, which had been overlooked in the dressings, was then removed, and the patient made an uneventful recovery.

Definite free interval in cases of head injury, and in which there is no hemorrhage, but concussion and laceration of the brain tissue, are not uncommon.

2. Another explanation may lie in the fact that immediately and soon after the injury the artery will not bleed rapidly, on account of the lowered arterial tension, due to concussion of the brain and the shock of the injury.

3. Again, after bleeding has been started, noticeable pressure will be exerted sooner if a large vessel is divided, than if a smaller branch is the source of the hemorrhage.

4. The length of the interval will depend upon the size, as well as upon the situation, of the clot. A large clot at the vault or over a silent area may give rise to no symptoms; a smaller one at the base or over the motor area of the brain, owing to the adjacent important structures, may cause very marked manifestations of its presence.

5. Another cause of delay in the onset of pressure symptoms is the possible escape of blood through a fracture of the skull, into the subaponeurotic space.

6. Hutchinson considers the termination of the free interval to be due to a secondary hemorrhage, which may come on after a varying length of time, and may be caused by unusual exertion, coughing, straining, great mental excitement, or suppuration. Towers reports a case in which such an explanation seems quite rational.

Phelps, Crile, Cannon, Cushing, Hill, Bergmann, and many others have made extensive observations and experiments in an effort to determine the exact nature of these secondary changes occurring after head injuries; but Kocher's explanation and classification of the steps in the process are undoubtedly the best and the most generally accepted at the present time. He divides the change into the following stages: (1) Compensationsstadium; (2) Anfangsstadium des manifestaten Hirndrucke; (3) Hohesstadium des manifestaten Hirndrucke; (4) Lahmungsstadium. He explains the free interval as follows:

7. As a result of the hemorrhage, there is an accumulation of blood within the cranium, and hence an increased intracranial tension, which at first produces compression of veins and lymphatics. The obstructed venous return increases the blood-pressure in the arteries, and the circulation continues as usual. The cells are supplied with sufficient nourishment, and they functionate in a normal manner.

This is the stage of "compensation" of Kocher, and corresponds to the free interval. Headache, caused by pressure on the dura, is, as a rule, the only symptom noticed. With a loss of this compensation, there is a lack of nutrition, and, in turn, an interference with function; pressure or localizing symptoms develop, and the free interval is terminated.

DURATION

The duration of the free interval is of great practical importance. A knowledge that the danger of compression can be eliminated in a given case will be a prime factor in the prognosis. The interval may be absent altogether, or it may be of unusual length; but if for more than a few days, it is usually suspected, or is at least open to the suspicion that the pressure symptoms are due to some complication other than simple bleeding. As given by the following authors, a great diversity will be seen:

Jacobson: from 1 hour to 10 days.
Wiesman: from 15 minutes to 4 days.
Holmes: from ½ to 4 hours.
Treves: from 2 to 3 days.
Brandon: seldom beyond 1½ hours.
Vaughan: occasionally as much as a week.
Tillmanns: from 4 to 12 hours.
Keen: from 2 or 3 hours, up to a day or two.
Kiliani: from a few hours to 3 or 4 days.
Scudder: from a few moments to three months.

From available literature, including the two cases reported herewith, I have collected 80 cases of meningeal hemorrhage.

The shortest interval mentioned was "a few minutes;" the longest was 6 weeks (Keen), and from 6 to 8 weeks (Kammerer). The average length of this latent period in these 80 cases is 67.6 hours.

Excluding the two cases of exceptional length, the next longest interval will be 17 days, of which there is only one; considering this, also, as unusual, the longest interval remaining will be 10 days, of which there are two instances.

After eliminating these three cases of unusual length, and taking the ten-day interval as an extreme, the average length of the 77 cases will be 26.3 hours.

In 19 of the 80 cases there was no free interval.

Subtracting these from the 77, the average interval of the remaining 58 cases will be 35 hours.

In order to arrive at a better understanding of the frequency with which these different intervals occur, the following summary is presented:

No free interval				19
Under 1 hour				5
Between	2 and	5	hours	14
Between	5 and	10	hours	2
Between	10 and	20	hours	5
Between	20 and	30	hours	4
Between	30 and	40	hours	2
Between	40 and	50	hours	6
Between	50 and	60	hours	1
Between	60 and	70	hours	1
Between	70 and	80	hours	1
Between	80 and	90	hours	0
Between	90 and	100	hours	3
Between	100 and	200	hours	6
Between	200 and	300	hours	2
Between	300 and	400	hours	0
Between	400 and	500	hours	1
Between	500 and	1000	hours	0
Between	1000 and	2500	hours	2

Distinct free interval was noted four times, in which there was demonstrated to be no hemorrhage within the cranial cavity. (As these are not cases of meningeal hemorrhage, they were not included in the above statistics.)

VARIATIONS

The typical train of events in a meningeal hemorrhage is—

1. Trauma.
2. Concussion (unconsciousness).
3. Consciousness (free interval).
4. Compression (unconsciousness).

But this may be variously modified. Trauma may be absent; and with trauma absent, concussion will not

be distinct. Concussion may be absent, with slight traumatism; but even in very severe injury there may be no evidence of concussion, as is seen in the case of Scudder, in which there was a compound depressed fracture of the vault, with escape of brain substance and hemiplegia, yet there were no symptoms of concussion of the brain.

In my group of cases, concussion was mentioned in the histories 61 times; it was present in 47 instances, and absent in 14.

The free interval may be missing, and was found to be absent in 19 of 80 cases. In 4 of these there was neither trauma nor concussion from which to date the interval, but in the other 15 the interval was absent because of severe injury, in which the concussion lasted until the compression became effective.

Compression may not manifest itself when the clot is small and over a silent area of the brain; absorption may take place, the patient recover, and the hemorrhage be unsuspected until discovered at an operation or autopsy.

The evidence of compression is shown by localizing and by general pressure symptoms, which usually accompany each other; but they may be separate and distinct. In depressed fracture of the skull, followed by hemorrhage, the symptoms usually appear at once, and, after a period corresponding to the free interval, increase in severity. In a case reported by Brandon, localizing symptoms appeared 10 or 11 hours after the accident, but general pressure symptoms did not present themselves for a number of days.

DIAGNOSIS

In arriving at a diagnosis of meningeal hemorrhage, one must consider the variety of the hemorrhage, and differentiate it from confusing conditions.

With a free interval there is, as a rule, meningeal hemorrhage, cerebral hemorrhage may be excluded.

The non-traumatic meningeal hemorrhage, with no free interval, may be confused with ingravescent apoplexy.

The differentiation into extradural and intradural, or epidural and subdural has been attempted upon the length of the interval. Jacobson, after a study of 68 cases, says that the long interval is more likely to occur in extradural bleeding, and M. Allen Starr corroborates this opinion. On the other hand, Laclerc, Kiliani, and Brion look upon a long free interval as significant of an intradural clot.

In the cases collected by the writer there were 76 in which the variety of the hemorrhage was mentioned: extradural, 48; intradural, 18; both, 10.

In the extradural the longest interval was 6 weeks; the shortest, a few minutes; and the average, 48.4 hours. Excluding the unusual case the longest interval was 10 days, and the average of the 47 cases, 27.6 hours. Deducting those 11 cases in which there was no free interval leaves 36, and the average length of these is 36.3 hours.

In the cases of extradural hemorrhage, the interval was—

Not present	11
Under 1 hour	6
Between 1 and 5 hours	11
Between 5 and 10 hours	3
Between 10 and 20 hours	3
Between 20 and 30 hours	2
Between 30 and 40 hours	2
Between 40 and 50 hours	1
Between 50 and 60 hours	1
Between 60 and 70 hours	0
Between 70 and 80 hours	3
Between 80 and 90 hours	0
Between 90 and 100 hours	1
Between 100 and 200 hours	2
Between 200 and 300 hours	1

1008 hours 1

With the intradural bleeding, the longest interval was 7 weeks; the next, 3 weeks; the shortest, half an hour; with an average of 143.3 hours.

Deducting the two unusually long intervals, the extreme will then be 10 days, and the average of the remaining 16 cases will be 56 hours.

If the 3 instances in which there was no free interval be not included, the average of the resultant 13 cases will be 69.2 hours.

In these cases the interval was—

Not present	3
Under 1 hour	0
Between 1 and 5 hours	0
Between 5 and 10 hours	0
Between 10 and 20 hours	1
Between 20 and 30 hours	1
Between 30 and 40 hours	0
Between 40 and 50 hours	2
Between 50 and 60 hours	1
Between 60 and 70 hours	1
Between 70 and 80 hours	1
Between 80 and 90 hours	0
Between 90 and 100 hours	2
Between 100 and 200 hours	3
Between 200 and 300 hours	1
504 hours	1
1176 hours	1

Where both an intradural and an extradural clot was found there was always, in addition, laceration and contusion of the brain.

In these cases the longest interval was 72 hours; the shortest, half an hour; and the average, 32.1 hours.

Deducting the 3 cases in which there was no free interval, the average of the remaining 7 was 45.9 hours.

In this class of cases the interval was—

Not present	3
Under 1 hour	1
Between 1 and 5 hours	1
Between 40 and 50 hours	3
Between 70 and 80 hours	2

From this analysis we find that the long free interval accompanies intradural hemorrhage, but it would seem that much stress cannot be placed upon the length of the free interval as a guide to the location and the variety of the hemorrhage.

From a theoretical point of view, it would seem that in intradural bleeding, which is frequently associated with injury to the cortex, symptoms of pressure and disturbance of brain function would occur sooner than if the pathological condition was separated from the brain by the thick and tense dura.

Other variations in the signs and symptoms may, or may not, serve as indications as to this point, but, as a general proposition, it may be stated that extra and intradural hemorrhage cannot be differentiated with any degree of accuracy. Fortunately, this is not always necessary, as the treatment is the same with the accumulation of blood in either locality. The pressure must be removed, and if it is not found above the dura, that membrane must be incised, and the clot looked for beneath it.

Hemorrhage from the diploic vessels rarely, if ever, causes symptoms.

Hemorrhage from the dural sinuses is similar to that from the meningeal artery, with the exception that it is slower, on account of the lowered arterial tension. Wharton has collected 70 cases of hemorrhage from the dural sinuses, of which 40 were from the superior longitudinal, 25 from the lateral, and the remainder from the others. Death occurred in 65 per cent of these cases; 26 times with intradural

clot, 11 with extradural, and 7 died from external hemorrhage.

In the cases of intracranial hemorrhage collected by Chipault, the bleeding was from the artery 72 times, and from the venous sinuses 30 times. In 80 cases collected by the writer, only 5 were from the sinuses, 3 from the lateral, and 2 from the longitudinal.

Hemorrhagic pachymeningitis, so well considered by Bullard and by Munro, offers an enticing, but as yet rather obscure, field for diagnostic acumen. Fortunately, again, the treatment in these conditions is practically the same as for bleeding.

The site of the injury and the source of the hemorrhage may not coincide and may be very distant. Fracture or injury at one side of the head and bleeding from the vessels of the opposite side is not a very uncommon occurrence. Such an instance is reported by Phelps, and Bergmann, in 99 cases, found 3 in which the hemorrhage was on the side opposite to the fracture. Fracture or injury at one point, and bleeding from a distant point on the same side of the head, also occur. Trauma to one side, and bleeding from the vessels of both sides, must also be called to mind in obscure cases.

When evidence of injury is absent, the diagnosis is, of course, made solely by the focal signs; but when these symptoms of pressure and the evidences of injury do not coincide, the greater stress should be placed upon the localizing symptoms. To quote Bartlett: "A localizing symptom is of far greater value than any external evidence of injury, as an indication of the proper point for the operative attack."

But, on the other hand, the fallibility of these focal signs must be remembered. Hemiplegia is almost always contralateral; i. e., paralysis of one side, and pressure on the brain on the opposite side, because of the decussation of the fibers at the base of the brain.

Very rarely there occurs collateral hemiplegia; i. e.,

the paralysis and the pressure upon the same side. Ledderhose collected 48 such cases from the literature. Dawbarn reports a case of this character in which the clot was found, at autopsy, upon the same side as the paralysis. Bryant, in the discussion, mentioned having had a similar experience, and having knowledge of another case.

It has been claimed that such an anomaly did not exist, but was due to faulty observation or interpretation of the symptoms on the part of the observer. But Dawbarn sent the brain with the beginning of the cord of his case to Dr. Gray, who made a careful examination and found that the motor fibers did not cross at the base, but passed down in the cord, each upon its own side. In cases with symptoms warranting an operation, and no clot is found, the opposite side of the brain should always be examined.

In fracture of the base, with lesion of the facial nerve in the Fallopian canal, the face on the side of the fracture and the extremities of the opposite side are paralyzed, thus giving the picture found in "crossed paralysis." Fractures of the limbs may cause confusion in determining the presence or absence of paralysis. Where a previous history cannot be obtained, previously existing paralysis may lead to very aggravating mistakes. Holmes cites a case in which a congenital attachment of the iris led to some uncertainty as to the diagnosis.

SOME CONFUSING CONDITIONS

Contusion and laceration of the brain, or even simple active hyperemia, may approach the picture of hemorrhage so closely that they may be confused.

Jopson cites a case with a history typical of hemorrhage, yet at operation no hemorrhage was found at either side. The cortical irritation in this instance was probably due to minute hemorrhages or lacerations.

Fairchild notes an instance in which, after an indirect trauma, and a free interval of three days, pressure signs gradually developed and progressed to a fatal termination. At autopsy there was found to be an extensive laceration of the brain.

Similar cases of serious damage to the brain, in which there has been a marked free interval, have been reported by Phelps, by Lemon, and by others.

The finding of blood in the cerebrospinal fluid after lumbar puncture is of rather doubtful value as a diagnostic measure. Tuffier, and Milian, and Widal have made numerous observations upon the cerebrospinal fluid in this class of cases.

Devraigne advocates lumbar puncture, especially in the new-born with cerebral symptoms, and claims for this procedure diagnostic, prognostic, and therapeutic value.

The sphygmomanometer and the hemocytometer have as yet thrown no appreciable light upon the diagnosis.

Abscess of the brain and hemorrhage may at times be differentiated with the greatest difficulty.

Kammerer mentions a case in which there was a free interval of six weeks, and a diagnosis of abscess was made, but at the operation an old blood-clot was found.

In Spencer's case of abscess there was an interval of only three days, and the symptoms might easily have been confused with those arising from hemorrhage.

As a rule, the longer interval will be found in conjunction with an abscess. Deaver says that pressure symptoms coming on immediately after the injury indicate a depressed fracture; if a short time thereafter, hemorrhage; and if some days after, pus.

Secondary apoplexy has been confused with meningeal hemorrhage by Bollinger. The free interval is usually longer, from 12 to 20 days up to several weeks,

but in other respects very closely resembles the condition under consideration.

Krönlein has mistaken an instance of fat embolism for meningeal hemorrhage. In both conditions there is a distinct period of euphoria, and in the cerebral variety of fat embolism the differentiation may be extremely difficult.

An absence of fat in the urine in a suspected case may exclude fat embolism, but the presence of lipuria does not mean that the symptoms are due to fat embolism, as fat in the urine is a frequent accompaniment of fractures of the long bones.

A large amount of fat in the urine would, of course, make one lean toward the diagnosis of embolism. The presence of fat in the sputum would practically confirm the diagnosis. A combination of both conditions might very easily take place.

Holmes recites a case in which fracture with an extradural clot was mistaken for paretic dementia. Thirteen days before death, the patient was found wandering aimlessly about the streets, unable to give an account of himself. He was then delirous for several days, and this was considered a delirium tremens. He was pronounced insane and placed in an asylum. A few days previous to death, the attendant noticed that the patient did not move his left arm. Death took place suddenly, and was supposed to be due to "paretic dementia," but the autopsy revealed fracture of the skull, with a large extradural clot.

Phelps cites a somewhat similar case. In non-traumatic hemorrhage the diagnosis is usually very obscure, and the operation, if performed at all, is generally in the nature of an exploration. Starr mentions such a case, in which he made a doubtful diagnosis of non-traumatic hemorrhage, but at the operation nothing was found to account for the symptoms.

Scudder calls attention to the condition of hyster-

oid semi-consciousness, and warns against confusing this with the deep unconsciousness of hemorrhage.

PROGNOSIS

The prognosis is uncertain. Without doubt, cases of meningeal hemorrhage do recover, that is, do not die, under no treatment, or the so-called expectant plan of treatment.

Phelps cites many cases of undoubted meningeal hemorrhage, unverified by autopsy, which were followed by perfect recovery.

Cases that recover perfectly are, of course, lacking in an absolute certainty as to the diagnosis, and the proportion of such perfect recoveries cannot be accurately determined upon. The frequency of evil after-effects of fracture of the skull is so well known that it need merely be mentioned. Cases showing such after-effects of meningeal hemorrhage as to make the patient a chronic invalid are related by Corning, Holmes, Wright, and others. On the other hand, cases in which a diagnosis of meningeal hemorrhage cannot be questioned, and the patients made satisfactory recoveries, are reported by Walton, Starr, and Fairchild. Fairchild's case was under observation for a long time, and there were no obvious evil sequelæ. But, notwithstanding the recovery in this instance, he advocates operative interference, with the object of removing the pressure.

In the 80 collected cases, recovery took place in 43, and death resulted in 37; 52 were operated upon and 28 were not. After operation, there were 39 recoveries and 13 deaths. Without operative interference, 4 recovered and 24 died.

In the 48 extradural hemorrhages, there were 32 recoveries; 28 with operation and 4 without. Death resulted 16 times; 6 after operation and 10 after no operation.

In the 18 intradural hemorrhages, 9 recovered, each

after operation, and 9 died—4 subsequent to operation and 5 without operation.

Of the 10 instances in which there were intra and extra dural bleeding, with damage to the brain, 2 recovered, each after operation, and 8 died—1 after operation and 7 with no surgical intervention.

TREATMENT

There is, of course, no treatment for the free interval; but for the condition that causes the termination of the free interval, the treatment is so important that it must be briefly considered.

The removal of the clot, i. e., the pressure, is the indication to be fulfilled.

Always shave the entire scalp in any case suspected of severe injury to the head.

The skull may be opened at one or more points, but preferably by a plastic resection. If the clot is not found external to the dura, that membrane must be incised; and if not found in either of these locations, the opposite side of the skull must be opened and the cavity explored before the search for the pressure is given up. The clot may be removed by a scoop, a dull curette, or a stream of normal salt solution. After the removal of the clot, the point of bleeding must be located, if possible, and then ligated. Hemorrhage from the meningeal artery will stop spontaneously much less frequently than will other arteries, because of its close attachment to the dura, which does not allow the vessel to retract, as it will in other locations. The artery should be surrounded by catgut on a full curved needle and ligated. Jopson mentions a case in which the clot was washed out, but the source of the bleeding was not located nor controlled, and death resulted from subsequent hemorrhage and compression of the brain.

In case the bleeding is from the artery as it passes through the foramen spinosum, ligature may be im-

possible. Then gauze packing, or plugging the opening with some foreign material, such as wood, ivory, nail, or catgut, must be relied upon. With hemorrhage from the sinuses, or when the source of the bleeding cannot be located, gauze packing will generally be quite successful.

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DISCUSSION

DR. WILLIAM JEPSON, of Sioux City, Iowa.—I wish briefly to corroborate the principles advanced in the paper of Dr. Connell by reciting a case in which there was an extradural hemorrhage, the result of the patient being thrown out of a wagon at night by a runaway team. The patient did not become unconscious at the time of the accident, but walked home, a distance of three-quarters of a mile, at 8:30 o'clock at night. In the morning the patient was found sleeping by his brother. He could not wake him. During this day it was found that the left arm and leg were the only members that he could move. That night he was operated upon. He had a hemorrhage, the result of a linear fracture, which passed down the parieto-occipital bone, involving the posterior branch of the meningeal artery. This same man, some three years afterwards, fell off of a load of hay, and sustained a second hemorrhage at the same site. He was brought to the city, but was delayed a couple of hours on the road by a freight train, and died when he came into the hospital. A post-mortem examination was made. We turned down a flap, loosened up the cicatrix which exposed the dura, and found here a second blood clot at the site of the old one. The question arose as to what manner this was brought about. Was it due to the fact that the tension could not be sustained by the broken skull, because this fissure had not united, in consequence of what happened where there was some separation, and whether this really produced the second hemorrhage? We were not able to determine the exact site of the hemorrhage any more than that it came from the posterior branch of the middle meningeal artery back of the site of the other.

DR. E. M. SALA, of Rock Island, Illinois.—I wish to relate a case that bears close relation to the one mentioned, and to show what we can do sometimes in stopping hemorrhage.

A boy in sliding down a baluster struck his head on the frozen ground; evidently fracture had occurred, yet there were no symptoms of it except unconsciousness. The boy was taken to the hospital and was operated on two hours after the accident. In cutting open the scalp the bone was fractured in six different places. I trephined the skull, and made an opening in the skull about three inches long and an inch wide, and found a blood clot about half the size of my hand over and back of the fissure of Rolando on the left side. The blood clot was removed, but there was still a hemorrhage from the substance of the brain. The question arose as to how we were going to stop it. I could not use artery forceps. I packed the cavity full of gauze, allowed it to remain, and left the wound wide open. I packed in quite a good piece of iodoform gauze, left it for forty-eight hours, after which I removed it, and the boy made a nice recovery, returning to consciousness that night.

I want to ask Dr. Connell what experience he has had in that particular line of stopping hemorrhages?

Dr. S. C. Baldwin, of Salt Lake City, Utah.—I want to add one case to the list of Dr. Connell. The case occurred this last summer. A man riding on the train, in trying to save walking one block, jumped off, and struck against a telegraph pole. I saw him an hour afterwards, and found a cut across the right eye. He was sitting up. I stitched the wound. He was put on the train, sent out very near to his home, and walked the rest of the way, something like three hundred and fifty feet. About eleven o'clock he went to bed. There was no sign of any injury whatever that we could discover, except this cut over the right eye. He had perfect use of the arms and legs, and had no sign of contraction or dilatation of the pupils at any time. That night, about two or three o'clock, his wife said that he became unconscious, and when I saw him next day he was breathing heavily. He was taken to the hospital, but we could not discover any sign of fracture. He lived until Tuesday night, this being Sunday night. There was no sign of trouble on the left side. On opening the skull a clot was found on the left side about 3x4 inches and half an inch thick, and when the dura was opened the whole brain was found full of small blood clots, yet during all this time there were no signs of any brain injury manifested except unconsciousness.

Dr. Arthur T. Mann, of Minneapolis, Minn.—It is in just such cases as the one reported by Dr. Baldwin that we have made our greatest advance in the last few years in head-

surgery. The picture is one of hemorrhage, although there are no localizing signs. We have but two sides to the head, and consequently but two places to consider in making our opening in search for the clot and for the bleeding vessel. When we select one of these we have one chance in two of being right the first time. If we do not succeed here there is but one other side,—go in!

TREATMENT OF VARICOSE VEINS

C. H. Mayo, A. M., M. D.

ROCHESTER, MINNESOTA

There are many operations in use at the present time for the relief of varicose veins. The disease is one that manifests such diverse conditions and symptoms that no method can be suited to all cases.

While the superficial veins are usually considered as producing the symptoms, it is probable that the deep veins, from the thinness of their walls, are often involved. The veins usually affected, with their various tributaries, are the long, or internal, and the short, or external, saphenæ. The internal extends from the saphenous opening in the upper part of the thigh down the inner side of the leg to the ankle, where, through the dorsal vein of the foot, it connects with the external saphenous vein, which extends from the external maleolus to the popliteal space, where it penetrates to the deep veins. The two saphenæ communicate at the knee; where also the internal communicates with the deep veins. The external occasionally extends higher, joining the veins of the outer and back part of the thigh. There are a number of valves in the large veins to aid in the support of the blood column. The internal saphenous nerve accompanies the vein from below the knee down. The external nerve is in relation with the external vein in the lower part of its course.

In most cases it is difficult to attribute any cause for

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varicose veins. The most probable etiological condition is that there exists a congenital defect in the vein walls or valves, or is an enervation; in fact, it is a considerable question whether normal veins give way under the ordinary strain of life. A large number of those affected have dilated or enlarged veins at from twelve to twenty-five years of age, although many years may pass before any serious consequences arise, and others do not suffer from any disabling symptoms during a long life-time. Vocation may often increase the condition and symptoms. Some patients attribute pregnancy as the cause; others, the pressure of tumors, phlebitis, or injury. There is also a type of the disease with multiple areas of dilatation of the fine veins, like small nevi.

The common symptoms are a sensation of fulness or weight of the leg, edema from standing positions, and pain from nerve irritation. The discomfort increases in severity with the use of the limb. Distention of the veins is usual, and in many cases there is a veinous circulation in the thigh, unchecked by valves and continuous with that in the deep vessels. More or less annoying pruritis is usually present, and is often accompanied with eczema. Pigmentation and discoloration of the skin from local hemorrhages is frequent, while one or more ulcers may increase the discomforts of the sufferer.

Many patients come for relief knowing their trouble and its cause; others describe symptoms resembling those of sciatica or even flat-foot, and it is possible that there may be some relation between the disease and late appearing flat-foot.

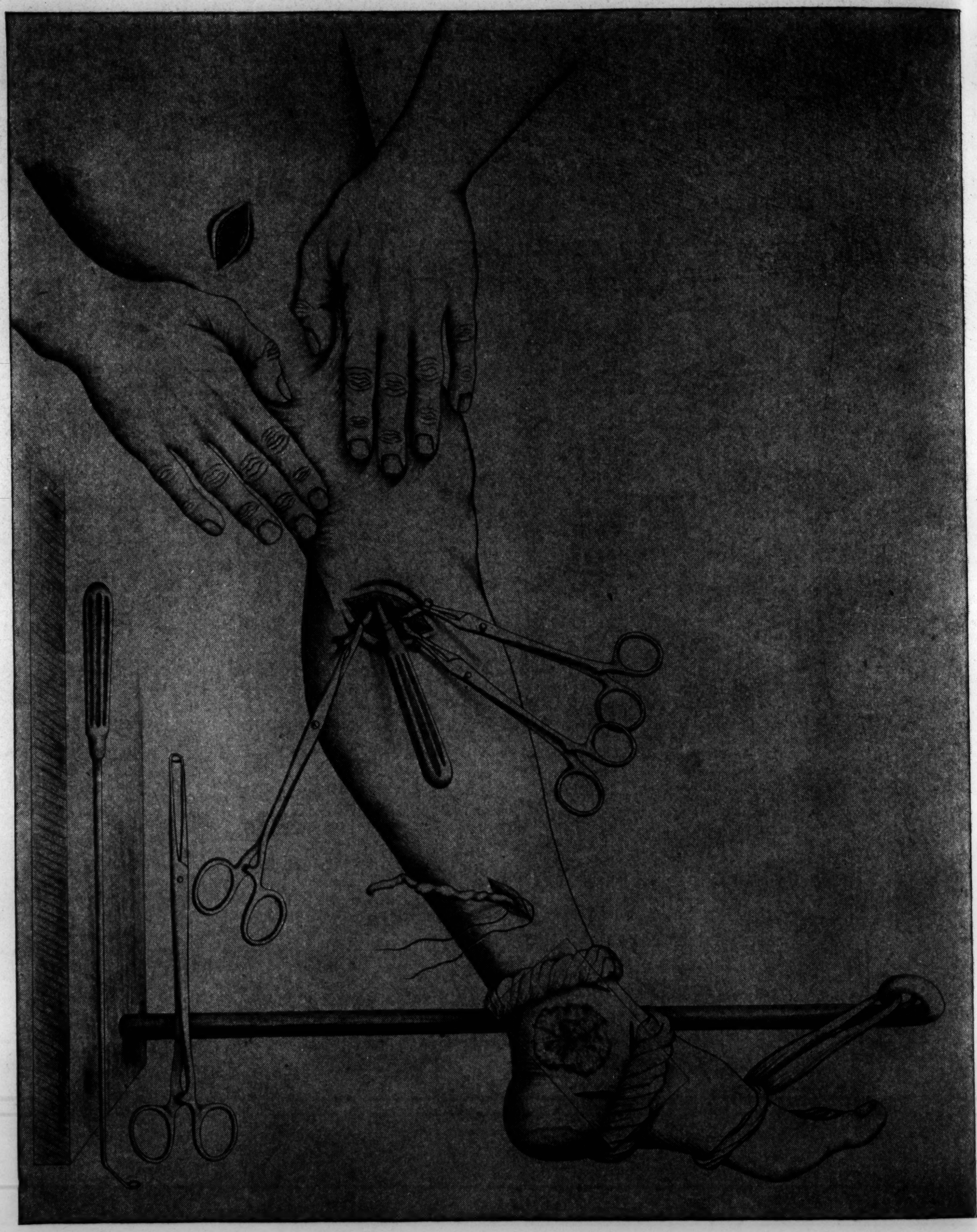
The so-called Trendelenberg phenomenon is tested as follows: The leg is elevated with the patient lying down, and when the veins are empty the long saphenous is compressed at its upper portion. The patient now stands erect, the pressure is removed, and if the vein fills from below up the valves are intact; if the

wave of blood descends, the valves are useless, and the veins sustain the venous gravity blood-pressure from the heart down, and for such the Trendelenberg operation is indicated.

In a few cases it is possible to obtain sufficient relief by a change in vocation or climate. The more common method is the wearing, during the day, of elastic supports, such as bandages or stockings. Leander's truss for the same purpose is worn to produce pressure in the saphenous in its upper portion. Operative measures for relief are as old as the history of surgery. Most of the known methods still have their advocates, and as they represent various principles in surgery we mention several of them: ignipuncture with Pacquelin or electrocautery, which is still employed; cutaneous suture and subcutaneous ligation of Velpeau and Delpech, which is now seldom used; injections of irritants into and about the veins, as Paul Vogt's injections of ergotin about the veins; Durante's method, which is that of passing catgut soaked in Piazza's fluid of sodium and ferric chloride into the vein through a canula; the resection of a portion, or the entire length, of the veins involved; Casati's operation by multiple ligation and excisions; multiple incisions with torsion removal (Bristol method); longitudinal incisions with immediate closure (Ledderhose); the circular incisions of Schaede and Peterson.

Probably the most popular operation is that of Trendelenberg, who ligates and removes a short section from the upper portion of the long saphenous. The more recent methods are subcutaneous removal in suitable cases and nerve-stretching.

As a rule thrombosed areas, while inflamed, have been treated by posture and local applications, although Kramer recommends their excision. In deciding the advisability of operation in cases which



Representing the technic of the operative procedures

give a previous history of severe phlebitis involving the deep vessels, we apply an elastic bandage from the foot to above the knee. If this bandage can be worn with comfort an operation should give relief. If the bandage causes discomfort it is probable that the superficial vessels are necessary to the circulation of the limb.

In considering the indications for operation there is less benefit to be expected from any type of operation made below the knee, if the vicious venous circulation of the thigh exists, while the Trendelenberg method could hardly be expected to cure cases of disease of the external saphenous or even the lower internal saphenous, where there are large channels of communication with the deep or external vein.

We have operated upon 185 cases of varicose veins, many times operating upon both limbs. We have not made the complete Schaede operation for several years, but a partial Schaede or oval or interrupted incision above or about a large ulcer is frequently made, combined with the excision of the ulcer and skin-grafting; at the same time the Trendelenberg operation, or the more extensive excision of the internal saphenous vein from the upper third of the thigh to a point six or eight inches below the knee, is also performed. The removal of short venous areas is reserved for those cases of involvement of the veins of the posterior thigh or the external saphenous. We have always been partial to the excision of the long saphenous for the majority of cases. The earlier operations were by a long incision of the vein. It required a considerable time to close the wound, and seemed to be quite a serious operative procedure, especially in the time involved to accomplish what should apparently be the trivial removal of superficial veins. This we partially overcame some years ago by long incisions, both in the thigh and in the leg, leaving five or six inches of skin intact at the side of the knee. The vein was separated above

and below, and under slight tension a pair of forceps was employed to enucleate and loosen the vein in the uncut area. Gradually the method of subcutaneous enucleation was increased until the whole vein was removed by means of three to five incisions of one inch in length. More recently we have devised a ring vein enucleator, which consists of a one-fourth inch ring of steel with a long handle, the whole instrument being not unlike a blunt uterine curette bent to an angle near its tip. We have also had made for the same purpose a pair of long forceps, which form a ring at the end when closed.

The vein is sought for and severed in the upper third of the thigh. The proximal end is ligated, the lower end is passed through the ring of the enucleator or placed in the ring of the forceps, and clamps are placed on the end of the vein. By a gentle pushing force, the vein being held to make tension and the tissues steadied on either side by an assistant, the ring or forceps is pushed down the vessel for six or eight inches, tearing off the lateral branches, when the point of the instrument is forced against the skin from beneath, and a small incision is made to the ring or forceps, which is pushed through the opening, holding the vein like a thread in a needle eye. The vein loop is drawn out of the opening and also from the instrument which is removed, rethreaded on the vein, and again forced through the new opening, following the vein, and is pushed down to a lower point, where the small incision is again made and the process of removal repeated. The small lateral branches are torn off, and, as a rule, they have enough muscle structure to close themselves. Should the main venous trunk break, a new incision is made below the knee, the vein exposed and divided, and the enucleation made in both directions from this point. Below the knee the branches are larger, and the vein is more adherent,

being more superficial, so that a shorter distance must be traversed.

If it is found that calcareous deposits, sacculations, or extreme weakness of the walls render the case unsuited to the enucleation method, and this occurs in about 10 per cent of the cases, the principle of operation should be changed to an open method, undermining only the section by the knee.

Hemorrhage is avoided first by position. An ordinary gynecological standard is placed in position, and the leg raised in straight or extended position and supported by the ankle. The position renders the limb partially bloodless, and also secures elevation and accessibility of the field of operation. Should any branch cause more than ordinary hemorrhage it can be checked by a pressure-pad held against the skin over the region from which the veins were removed, or by small packs, which are left for a few minutes in the incision from which it arises.

We have tried the inversion of the veins (Kellar method), but found that ordinary forceps would subcutaneously loosen and torsion out short lengths without much difficulty.

When necessary to skin-graft an excised ulcer we apply a twisted roll of gauze about the leg above and below the grafted area to support a sheet of sterile celluloid or wire gauze held in place by a strip of adhesive plaster. The final bandage is applied from the foot to the body, and a small area is cut out over the protective. This serves as a window through which to watch the condition of the graft, which usually unites with one dressing.

In our experience the subcutaneous removal of that portion of the internal saphenous vein extending from eight inches above the knee to four inches below it, accomplishes by one method all that is possible to gain by either the Trendelenberg or Schaede, in in-

terrupting the main channel of superficial circulation and also in checking communication with the deep circulation in this region.

Should there be a persistent eczema in spite of previous preparation, the operation is proceeded with as usual, the ulcer being excised before the enucleation of the vein. The ulcerated area is skin-grafted. The eczematous area is now painted with compound tincture of benzoin or an acetone solution of gutta-percha after Murphy's plan, which acts as an aseptic varnish, literally sealing this surface until the incisions have themselves become sealed against infection. The dressing is applied, and the leg is maintained in a somewhat elevated position for twelve days. The patient is then allowed to get up, wearing an elastic porous supporting bandage for a few months.

The method outlined has reduced the time for operation very considerably, and has placed it in the class of relatively trivial operations when uncomplicated by sepsis or embolism.

As to the cures from the various methods: Goerlich reports from 42 operators 1,425 cases with from 65 to 85 per cent of cures from the ligation of the internal saphenous. In this report upon the latter results, from one to eleven years following the Trendelenberg operation, there were 51 cases, representing 69 operations, examined, with the result that 84 per cent were satisfactory and 16 per cent failures. The report by letter from 29 patients, representing 39 operations, gave 70 per cent satisfactory, 30 per cent failures or worse. The Trendelenberg phenomena recurred in 42 cases after excision of a piece of saphenous vein.

The first is probably a fair statement of the cures resulting from one or a combination of methods, but the percentage of failures is somewhat high, as some are much improved, though not well. The causes of recurrence were from a widening of the collateral

veins, formation of new veins, and, it is claimed, from regeneration of the saphenous vein itself. It is probable in the latter cases that the more superficial and smaller vein, often noticed in the same region, has been removed, or has dilated and practically formed a new saphenous. The dangers are from pulmonary embolism, which Goerlich reports as occurring twice in 108 cases in Von Brun's clinic. Sepsis is rare, although a serious possibility and difficult to guard against in some cases with ulcer and eczema.

REPORT OF A CASE OF GLUTEAL CAVERNOUS ANGIOMA

J. E. SUMMERS, JR., M. D.

OMAHA, NEBRASKA

The cavernous nevus or angioma is a form of blood-vessel tumor included under the general heading of angiomata, and has typical clinical and pathological findings.

Angiomata are divided according to their peculiar predominating characteristics; such as the kinds of blood vessels (veins, arteries, or capillaries) most conspicuous in their formation, as well as the form, size, and life history of the growths. They are usually recognized under three headings: (1) the simple nevus; (2) the plexiform angioma; (3) the cavernous angioma.

The cavernous angiomata, because of their erectile type, have been likened to the spongy tissue formation of the erectile bodies of the penis. The tumors (Senn) are of larger size than the capillary variety, and are composed of irregular blood spaces and sinuses, whose walls are fibrous septa lined with endothelium and communicate freely with one another.

The new blood spaces are formed by angioblasts (a form of fibroblasts) whose function is to produce new blood vessels in the cellular connective tissue.

Some cavernous angiomata are made up by vessels and spaces of irregular forms; others, of these spaces alone. When this latter condition exists, it will be found that blood vessels, sometimes of large size, will be found in its periphery. Cavernous angiomata are usually congenital, and are most commonly found in the skin, deep connective tissue, bones, liver, spleen,

kidney, and tongue. As a congenital affection we occasionally see a combination of cavernous angioma with lipoma—a nevolipoma. Likewise, as a result of clotting, a cavernous angioma may take on a cystic degeneration. (Treves.)

Clinically, cavernous angiomata are compressible and irregularly lobulated. When situated near the surface, they are of a blue color. A cutaneous nevus may lie over a more deeply situated cavernous tumor, and large surface vessels may be seen to dip into the angioma.

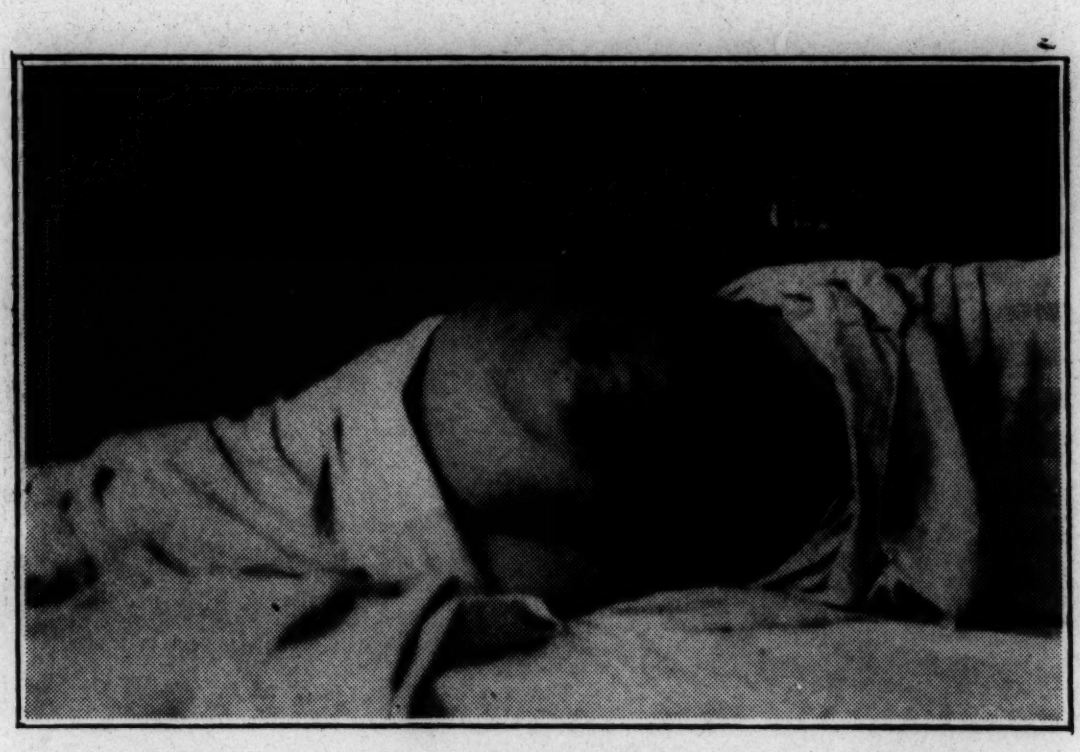


Fig. 1. Photograph taken before first operation in 1897.

The occurrence of cavernous angiomata in voluntary muscles, according to Sutton, is uncommon, and upon examination of the literature I find little written. Campbell de Morgan (Brit. and Fr. Med. Chir. Review, 1864) reports a case occurring in the semitendinosus muscle of a girl ten years old. The tumor was congenital. Because of its rapid growth it was removed, and found, histologically, a characteristic angioma. A few other cases have been reported; among them, one of the deltoid excised by Holmes Coote. The patient was a little girl, and the tumor was congenital. Liston removed one of these growths, probably congenital, from the semimembranosus muscle of a ten-

year-old boy. Besides these cases referred to by Sutton, little is to be found in our text-books, although, no doubt, many cases have been met with by surgeons, but not recorded.

The subject of my report is J. C., 33 years of age, occupation laborer, single, native of Ireland, height 5 feet 11 inches, weight 165 pounds. My knowledge of this man dates back eight years, at which time I saw



Fig. 2. Photograph taken before operation in January, 1905.

him, in the absence of a colleague, in the Douglas County Hospital, Omaha, suffering with a big hematoma of the left buttock, evidently caused by the rupture of some large blood vessel or blood vessels, and due to a fall. My colleague attacked the tumor by a

free incision, and met with less active hemorrhage than expected. The patient's stay in the hospital was not prolonged, and he did not again come under my observation until January, 1905. At this time he was brought to the Clarkson Hospital with an ugly-looking swelling in the left gluteal region, this having developed suddenly as the result of a fall from a wagon. The history showed that since his operation he had been well, although he felt there was "something wrong" deep in the left buttock. The photograph shows the size of the swelling. It had the usual characteristics of a hematoma, the blood being nearer the surface in some areas than in others, and in certain places threatened rupture. It was non-pulsating, and the skin was uneven over parts of the area involved, and in it were many flat lipomata and nevolipomatous tumors, varying in size from a dime to a half-dollar. Notwithstanding the history of the case, I had to consider the probability of dealing with a ruptured aneurysm of the gluteal or sciatic arteries. That the origin of the hemorrhage was deeper than the skin was evident.

A ruptured gluteal or sciatic aneurysm would present symptoms similar to those of the case presented, but the blood of a ruptured sciatic aneurysm would hardly appear towards the surface so rapidly; besides, there had been no history of sciatic pain prior to rupture (a usual symptom). There were no pelvic symptoms. These seemed to eliminate the sciatic artery. However, there was nothing to eliminate a ruptured gluteal aneurysm, except perhaps the lipomata on the skin over the swelling, and these might readily be accounted for by the earlier injury. I therefore determined, as a precautionary measure, before operating, to control the circulation by having an assistant compress the left common iliac artery through an abdominal incision.

This was done, and upon cutting into the swelling and clearing away the clots, it was found that much

of the upper and middle portions of the gluteus maximus muscle were involved in a cavernous angioma, and there were many large blood vessels, arteries, and veins entering the growth around its periphery. The portion of the muscle involved with much over-lying skin was excised, and the afferent and efferent vessels ligated. There was no hemorrhage other than such as I desired my assistant to allow, in order that I might individualize all the blood vessels concerned. The tumor proved to be a true cavernous angioma. There was no sign of a return of the tumor several weeks ago, when I last saw the man.

GASTRIC DYSPEPSIAS AMENABLE TO SURGICAL TREATMENT

By William E. Ground, M. D.

SUPERIOR, WISCONSIN

In dealing with the conditions underlying stomach dyspepsias in which surgical intervention is indicated, I shall not attempt to treat systematically of diagnostic technic, nor shall I consider to any great extent the symptoms, for these can be better obtained from the books. My object is to indicate as accurately as possible what the literature, the observation of other surgeons, and my own experience would lead us to expect from surgical principles applied to the alleviation of this distressing and often dangerous class of ailments.

Turck defines dyspepsia as conscious digestion, normal digestion proceeding unawares and without sensation. By this standard it will be seen how comparatively common indigestion really is, and how important it is to recognize and treat these cases along scientific and rational lines. The time was when the treatment of chronic gastric indigestion or dyspepsia meant an off-hand prescription of bismuth, pepsin, or charcoal, or a bitter tonic, with perhaps a mineral acid and a cursory allusion to diet, and with little or no preliminary examination of the patient as to the exact conditions at fault. As a consequence we have chronic digestive disturbances galore calling for daily consideration.

Most cases of stomach dyspepsia yield readily to appropriate medical treatment, but there be many who have not received benefit from drugs, lavage, electricity, hydrotherapy, exercise, and diet, in whom sur-

gical intervention affords the only hope of restitution.

It is now recognized that many forms of digestive disturbance are dependent upon conditions entirely outside the stomach, and involve the stomach either by direct extension of the pathological process or indirectly by nerve influence. Among these may be mentioned inflammatory or irritative lesions in the biliary apparatus, pancreas, duodenum, or appendix, and adhesions of the stomach to surrounding viscera. Within the stomach conditions remediable by surgical means are perforative and non-perforative gastric ulcer, chronic gastric ulcer, hemorrhage, pyloric obstruction, gastric dilatation with stasis, hour glass contraction, hyperchlorhydria, and cancer. The question of operative interference in some of these conditions is still in dispute, but the wisdom of referring cases of perforating gastric ulcer, with or without adhesions, cicatricial stenosis of the pylorus, adhesions of stomach to any of the surrounding structures, and perhaps chronic gastric ulcer, to the surgeon, is now pretty firmly settled.

Mr. Gilbert Barling says: "The patient who gets gastric catarrh from exposure or unsuitable food, the overstrained professional or business man whose poor gastric juice, the result of exhausted nerve force, fails to digest the food placed into the stomach, the poor drudge who has no masticating teeth and is always drinking stewed tea—these are not the people to be treated by surgical operations. Were gastro-enterostomy the means by which the greedy could escape the penalties of overeating, or of the eating of food which was wisely prohibited by the physician, what a vista of surgical interference would be opened up."

PERFORATING GASTRIC ULCER

The first condition admittedly demanding surgical operation is perforating gastric ulcer. Although perforations of the stomach are perhaps not as fatal as

similar lesions lower down in the intestinal tract, still it is the part of wisdom to resort to operation immediately. The cause for the diminished tendency to fatal peritonitis in perforations of the stomach is partly anatomical, but more particularly for the reason that the stomach-contents are disposed to be less virulently septic, and the micro-organisms less numerous at the pylorus. The number of micro-organisms and their virulency increases as we proceed down the intestinal canal, until the large bowel is reached when they gradually diminish.

CHRONIC GASTRIC ULCER

As to the advisability of operating on cases of chronic gastric ulcer, opinions differ widely. Some go so far as to say operation is never necessary, and that by proper medication, rest in bed, and rectal feeding all cases can be cured. Others contend that gastric ulcer of more than six weeks duration is essentially chronic, and demands gastro-enterostomy. Mayo says chronic gastric ulcers are chronic from the start. Perhaps it could be more properly said they depend upon underlying conditions which tend to institute and propagate ulcer-bearing, and, furthermore, operation does not always remove this condition. It is reasonable to assume in this, as in many other conditions about which there is much controversy, that the medium ground is more nearly correct.

Although the contrast between the autopsy findings and the clinical diagnosis of gastric ulcer is most marked as evidenced by various reports in this country, Mayo quotes more recent statistics, furnished by Bulstrode who analyzed all the cases admitted to the London Hospital for gastric ulcer from the beginning of 1897 down to 1902. They were just 500 in number, 98 men and 402 women. Out of this number no less than 48 (nearly 10 per cent) died from peritonitis; 13 (or 2.5 per cent) from hematemesis; and 28 (5.5 per cent)

from other causes. The total number of deaths was 89, or approximately 18 per cent, taking all cases together. Startling as this mortality is, it is not all the effects of gastric ulcer, since there must be a considerable morbidity accompanying non-fatal cases.

Within the last two years I have operated upon 7 patients for supposed chronic gastric ulcer. In 4 the ulcer was demonstrated, and in 3 it was not. In all cases the symptoms clearly indicated ulcer. In no case was the stomach opened and the interior of the stomach searched. Those cases in which no ulcer was found seemed to receive as much benefit as those did in which ulcer was plainly evident. The immediate cessation of symptoms was established in all cases. Two have relapsed within a year into a condition much the same as before operation although I must say these patients exhibited an utter disregard of any prohibition in the way of diet, thinking now that they have had an operation done on their stomachs they should be able to "eat anything." There was one death in the list. This man was doing well when on the sixth day his wife surreptitiously gave him a hearty meal of grapes and milk, after which he developed pain in the abdomen, vomiting, abdominal distension, peritonitis, and died on the eleventh day. All anastomoses were done by suture, the duration of the actual operation ranged from thirteen to twenty-five minutes, depending upon complications. One bystander remarked that owing to the ease and rapidity with which the anastomosis by suture could be made, he did not see any necessity for resorting to the Murphy button, the McGraw ligature, or any artificial device.

I append one case as serving to illustrate a type of this class. The patient was a woman, aged 30, a stenographer, who had been troubled with painful digestion for about three years. Unless the utmost care was used she would suffer tremendous pain after food,

and often vomiting, and a few times the vomitus contained blood, and occult blood was often found in the stomach-contents. All forms of medical treatment, approved and unapproved, had been tried. Her former weight was 150, but she now weighs 115. She has always been a hearty, aggressive eater.

Operation, March, 1905, showed indurated ulcer about the size of a quarter on the posterior wall of the stomach near the lesser curvature about two inches from the pylorus. Posterior gastro-enterostomy by suture was done, patient suffering no shock or vomiting after operation. After leaving the hospital she spent the summer in the West, and wrote that she could eat five griddle cakes every morning, that she had gained twenty-nine pounds, and that her friends now call her "fatty." She is now engaged at her occupation without digestive disturbance.

The principle supposed to be involved in gastro-enterostomy for the cure of ulcers of the stomach and duodenum, which frequently co-exist, is an old one. Kelsey, many years ago, recommended and practiced left inguinal colotomy for the relief of malignant and benign ulceration about the rectum and in the urethra. Reginald Harrison called attention to the fact that ulcers and strictures would disappear if the irritating effects of the urine were removed by establishing a deep perineal fistula; and so in the stomach. In consideration of the fact that ulcers occur most frequently in the pyloric third or in the lesser curvature, it was assumed that by making an anastomosis with the bowel at the most dependent portion of the greater curvature the food mass would be short-circuited so to speak, and be permitted to pass into the bowel without coming in contact, to any material extent, with the raw pyloric section. The process of digestion is then supposed to be completed in the intestine, and thus pain and pylorospasm due to irritation and overdistention are avoided.

Closely associated with ulcer is the sequence of cicatrization and subsequent contraction of the stomach, and when this process involves the pylorus, and leads to stenosis and obstruction, later, if this be prolonged, gastric dilatation and atony will result. Whether the pylorus is obstructed by spasm, due to the presence of the ulcer or to hyperchlorhydria, which almost always accompanies non-malignant ulcer, or to the cicatricial contraction following the healing of an ulcer, the pylorous is rendered incapable of readily transmitting its contents, the stomach becomes distended, and its muscular walls weakened, leading ultimately to permanent atonia gastrica. Stomach dilatation may possibly be due to atony alone, but it is much more frequently due to mechanical obstruction at the pylorus. In this condition of gastric stasis, food may remain in the stomach a day or more, whereas, as Riegel says, it should empty itself within seven hours at most. In fairly advanced cases when the obstruction has given rise to a compensatory hypertrophy of the stomach, the peristaltic movements may be seen and felt through the abdominal walls, usually accompanied by pain and vomiting, the peristaltic unrest of Kussmaul. Later, when the stomach begins to dilate and assume a more passive state, the patient complains of fulness and epigastric pains after meals. Fermentation takes place, causing eructations and heartburn and frequently vomiting. Vomiting is a most prominent symptom when gastrectasia and fermentation are well established. When this sequence of events is set up, there is but one remedy, and that is surgical intervention.

PERIGASTRITIS

The frequent result of an unhealed gastric ulcer is to set up changes outside of the stomach—a circumscribed perigastritis—which eventuates in adhesions from hardened connecting bands between the stomach,

and liver, intestines, or diaphragm, thus crippling the movements of these viscera, preventing food passage and giving rise to violent dyspepsia in that way.

A case in point: A previously healthy male, aged 47, a lumber-shover before his health failed two years ago, since then what time he has been able to attend to any kind of business he has been a saloonkeeper. He has drunk considerable and has always been a hearty eater using no judgment either in his manner of eating or in the amount or kind of food eaten. Although he had complained of difficult and painful digestion for several years, off and on, still no definite history of gastric ulcer or other serious lesion about the stomach could be obtained. I might add, however, that in loading boats at this port for lake transportation, he was in the habit of resting the end of heavy planks upon his abdomen about the epigastric region, and from there lifting them upon the pile. In this way his stomach or the region immediately adjoining was being continually subjected to mild traumatism. About two years ago he began having marked distress after meals, and this difficulty so increased that he was finally unable to eat any solid food, and was compelled to subsist entirely upon a milk diet in small quantities at a time. His distress came on about half an hour after meals, rarely vomited, and no material food stagnation existed, as his stomach was empty within the allotted time, even of prune and raisin skins, which showed a patent pylorus. Gas-distention was always marked and the greater curvature of the stomach extended to below the umbilicus. Chemical examination of stomach-contents was negative. Although he always complained of distress in the region of the stomach, he had many general symptoms. He fatigued easily, had tingling in his limbs, and could not sleep well, said he could hear water dripping from his head to his stomach and had hissing in his ears. In fact he was a typical neurasthenic, and had been so treated by half a dozen

physicians at the head of the lakes, but he never improved a particle. So pronounced were his mental symptoms that the question of having him adjudged insane was seriously considered. Some of his physicians noted that no matter what other symptoms he complained of he promptly reverted back to his stomach.

Upon the strength of this he was referred to me for surgical consideration when the above history was obtained. I determined upon an exploratory operation, which was to involve more particularly the stomach and biliary apparatus. An incision was made through the right rectus muscle, and I at once came upon a mass of dense adhesions attached to the anterior abdominal wall. This proved to be a fold of great omentum, binding the pylorus and lesser curvature of the stomach to the wall of the abdomen. It was with great difficulty that these adhesions were separated. No further trouble with the stomach was found, nor was there any evidence of disease of the gall-bladder or ducts. Realizing the futility of the Cargile membrane and the dusting powder to prevent adhesions reforming and having just read Andrews' method of colon substitution for similar conditions, I accordingly brought up the transverse colon and anchored it between the stomach and abdominal wall. This patient recovered promptly from the operation. Although his digestive troubles, as well as his nerve symptoms, are much improved, in fact have been almost entirely absent since the operation November 29th, I realize it is too early to pass judgment.

HEMORRHAGE

Hemorrhage is another condition associated with gastric ulcer which may call for surgical treatment. It is much more common in acute than in chronic ulcer. While hematemesis is a frequent symptom of gastric ulcer it must be remembered that it is not in-

variably so. At any rate, the stomach has been opened for profuse bleeding and no ulcer found, but instead extensive capillary oozing. W. J. Mayo has called attention to the fact that ulcers may be so minute as to escape detection unless very careful search is made by bending the mucous membrane over the finger, much the same as observing the weave in velvet.

We must not overlook in this connection the fact that we may have gastrorrhagia from cirrhosis of the liver, aneurysm, heart disease, or other general conditions. It is recommended by Robson and Moynihan that, in case operation is resorted to for the control of hemorrhage, it be limited to indirect treatment by gastro-enterostomy, and that no attempt be made to find the bleeding point by gastrotomy, unless some obvious spot on the stomach wall is easily accessible. In ulcer of the duodenum, and especially where bleeding is a prominent feature as indicated by bloody stools or melena, operation by pyloroplasty or gastro-jejunostomy is clearly indicated. Perhaps the most satisfactory results from operation in this class of cases is obtained where we have slight bleeding frequently recurring, tinging the vomit with blood, or a more or less daily slight hemorrhage into the bowel leading to anemia and ill health. I have had one such case in a young woman of 23 in whom I did a gastro-enterostomy two years ago, and the result has since been most gratifying, as she had been practically an invalid for many months before the operation.

MALIGNANT DISEASE

Until the investigations of Cuneo upon the lymphatic distribution in the stomach, and the studies of Borrman and Cuneo regarding the pathogenesis of cancer of the stomach, the epoch-making clinical researches of recent operators could not have been made. It is clear that carcinoma is a local disease, and that there exists a time in its life-history when it could have been

effectually and safely removed. Early and wide removal has given satisfactory results in those organs accessible to the early diagnosis. Much of the study of diseases of the stomach, and especially cancer, is so hampered by tradition and such a large amount of useless verbiage is dispensed regarding the value of chemical findings, that valuable time has been lost, and the patient gets to the surgeon too late to be of any avail. There are no signs that will enable us to make a positive diagnosis, except an exploratory incision, and as simple incision of the abdominal wall, a digital and visual exploration of the stomach is so devoid of danger, as compared with the benefits of an early operation, we are fully justified in doing it in every suspected case. In favorable cases a partial gastrectomy is attended with a low immediate mortality, and the prospect for an ultimate cure has been shown to be very promising. Even in advanced cases where the malignant growth is obstructing the pylorus a gastro-enterostomy adds materially to the comfort of the patient and prolongs life. I have done gastro-anastomosis in four cases where they were near starvation and in extreme physical condition. One patient lived six months after the operation with much less suffering; another died the next day, who, owing to his greatly reduced condition, was operated upon under local anesthesia; two others have received operative treatment within the last two months and are relieved of the distressing vomiting and gaseous distention formerly experienced. Kroenlein and Mikulicz kept an accurate record of their gastro-enterostomies for advanced malignant disease, and place the average length of life at a little over 12 months for the non-operated cases, whereas in the cases in which gastro-enterostomy is resorted to the average was 15 months.

GASTROPTOSIS AND DILATION OF THE STOMACH—FOOD STAGNATION

Atony of the stomach may exist for a long time without giving rise to symptoms unless pyloric obstruction exists or the circulation is interfered with. It is a clinical fact that the interference with a free return of venous circulation will cause paralysis of the walls of the digestive tract and consequent tympanites much more promptly than a mechanical obstruction. Therefore so long as the circulation and innervation of the stomach are maintained individuals may live for years with abnormally dilated and displaced stomachs, but as soon as compensation fails there appear suddenly and in a surprisingly brief time all the symptoms of stomach dilatation. Some cases of acute dilatation may be explained in this way. Whether atony of the stomach occurs independently of pyloric obstruction or not, I am certain from my own observation that we may have a dilated splashing stomach without pyloric stenosis. The advisability of operating upon neurotics with dilated, prolapsed, or atonic stomachs is pronounced against by Mayo, and in the main I think justly. But before we put a patient down as a neurotic, we should be very sure that there is not some organic disease underlying the neurosis. Abdominal relaxation, visceral ptosis, and neurasthenic conditions may be caused by a hernia, especially in the linea alba, or pelvic floor herniation, the result of trauma during labor. There is always an organic cause underlying the initiation of the neurosis which starts the vicious circle we call neurasthenia, the foundation of which is probably dependent upon a peculiar constitutional substratum. It has been reliably estimated that 90 per cent of the neurasthenia as we see it to-day is due to lesions of the abdominal viscera, chief of which visceroptosis, and I believe it. Although much can be done in the treatment of these

cases by rest in bed, medication, and external support, still there will be not a few patients in whom surgery will have to be resorted to to effect a cure. The following case will serve to illustrate this position:

Mrs. F., aged 43, consulted me for neurasthenia and nervousness due supposedly to the approaching menopause. She had borne several children, and gave a history of spells of painful digestion for several years, and was emaciated to a skeleton. An examination revealed ptoses of all the organs from the pelvic floor to her diaphragm. The uterus was prolapsed; she had cystocele and cystitis, rectocele, and inability to empty the bowel readily; she had nephroptosis and Dietl's crises; her stomach was in a position of extreme ptosis the greater curvature being 3 inches below the umbilicus, and greatly distended giving her much distress, and there was food stagnation. I began by restoring the pelvic floor and overcoming the bladder prolapse, correcting the retroposed uterus, and I attempted to relieve the atonia gastrica by external abdominal support and taking the weight of the clothing from around the waist-line. This seemed to help for awhile, so that she got out of her bed-ridden condition and gained several pounds in weight. Her gastric symptoms were still persistent and pronounced after a period of four months, so I determined to do a gastro-enterostomy. The stomach was found much dilated and the pylorus much thickened admitting the tip of my little finger with difficulty. The relief was decided from the first and her stomach symptoms rapidly disappeared, and in two months she was able to do housework and come to my office in a street-car. It is now about one and a half years since her first operation and she has moved with her family to one of the range towns and has taken sole charge of her household duties.

I am firmly of the opinion that we do our so-called neurasthenic patients a great injustice if we do not investigate closely the condition of the abdominal viscera.

HYPERCHLORHYDRIA

In reference to this condition Mayo Robson has this to say: "There is secreted a gastric juice that contains an excess of hydrochloric acid, which is associated with very definite symptoms of pain and discomfort directly the stomach has parted with the food from the last meal, a distress that is sometimes known as hunger-pain. Such symptoms are generally, if not always, associated with ulcer either of the stomach or the duodenum, or both. If the symptoms are not relieved by careful dieting and medicinal treatment, surgical means, in the shape of a gastro-enterostomy, should be resorted to."

In two of my cases where ulcer could not be demonstrated, but where hyperchlorhydria existed and symptoms abated after operation, the explanation might be made upon this basis.

GASTRO-ANASTOMOSIS

The first practical application of gastro-intestinal anastomosis was made by Wolfler, in 1881, at the instigation of his assistant Nicoladoni. Wolfler had the abdomen open for the purpose of removing a cancer of the stomach, but found the disease too extensive to permit removal. He thereupon established an anastomosis between the stomach and intestine to allow the food, which had been obstructed at the pylorus, to pass into the bowel. Since then many modifications and devices have come into use, and it would be interesting to study these, but the purpose of this paper will not permit. The operation of choice to-day, when radical removal of malignant disease is not intended, is a posterior gastro-enterostomy, the anasto-

mosis being made between the most dependent portion of the greater curvature of the stomach and the jejunum about four or five inches from its junction with the duodenum. This portion of the bowel naturally lies up against the posterior surface of the stomach, and seems to give the best results. In order to do this operation it is necessary to completely eviscerate the stomach and transverse colon, and turn it entirely over, bottom side up. This maneuvre would be impossible in cases of advanced malignant disease or extensive adhesions, and under such circumstances, an anterior attachment becomes inevitable.

The next operation most in favor with the majority of surgeons for pyloric stenosis, chronic ulcer, gastric dilatation with and without atony, and perhaps hemorrhage, is connected most directly with the pylorus itself. I am of the opinion that these operations will come more into favor than they are now, inasmuch as they conform more nearly to natural anatomical conditions and physiological requirements. They are designated as pyloroplasty or perhaps to speak anatomically gastro-duodenostomy, because the operation is not confined to the pylorus, but must involve the stomach and duodenum. The operation devised and called pyloroplasty by Finney, is to my mind the best of this class of operations. Clinical experience, as well as the experiments of Cannon and Blake, of the Harvard Physiological Laboratories, seems to indicate that the rationale of gastro-jejunostomy will have to be revised. I consider the contribution of Cannon and Blake most important and timely, coming as it does at a time when treatment of diversified stomach disorders by gastro-enterostomy is receiving such a boom. It takes time for us to learn that recovery from an operation does not mean a cure of the patient, nor perhaps even his relief, not to say anything of his possible detriment as months and years go on. In my own limited observation I know of a few

cases where an anastomosis had to be taken down and a second operation done within a few weeks after the original for alarming symptoms, and I also know of cases where the expected relief was not obtained, notwithstanding the fact that the operation was done by a most expert gastro-enterostomist. Many brilliant cures have been made, and this operation is not unlike intubation in its immediate benefits when indicated. In fact I have almost universally observed the praise bestowed upon the operation by freshly gastro-enterostomized patients. In many this is undoubtedly due to the beneficial effect of the operation, but in some I surmise the rest in bed and judicious feeding has had considerable to do with the cessation of the symptoms. Fully realizing the unsettled state of this question I heard W. J. Mayo say in a discussion of this subject at the last meeting of the American Surgical Association, at San Francisco last summer, that before the results of their work was published, some three or four months, they had greatly changed their methods. It is barely possible that in cases of confirmed chronic gastric ulcer the operations of gastro-enterostomy and pyloroplasty are, as Krogius contends, only palliative. He reports in the Archiv. fur klin Chir., Sept. 4, six cases who died within a short space of time after having undergone one or the other of the above-mentioned operations, from hemorrhage or peritonitis following the operation. He considers the existence of a latent or apparently cured gastric ulcer treated by palliative surgery constitutes a grave risk, and that the disturbances due to the ulcer persist in many cases notwithstanding these operations, septic ulcer of the jejunum or carcinomatous transformation of the ulcerated area being by no means rare. He recommends a radical excision of the ulcer-bearing area as the only ideal operation.

By close observation of the literature we notice that a gradually increasing number of cases of jejunal ul-

cers following gastro-enterostomy are being reported. From the anatomical and physiological standpoint we should rather expect this to be the case, as in no instance is the acid gastric juice continually poured into the intestine. The presence of free acid in the stomach opens the pylorus, allowing a jet of acid chyme to pass into the duodenum, and in return the acid in the duodenum closes the pylorus and stimulates the flow of alkaline pancreatic secretion.

ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS

The stomach is the first and the largest dilatation of the digestive tube within the abdominal cavity, and the first to have a peritoneal covering, and may be described as a large hollow compound gland, the walls of which contain powerful muscular elements, and are lined with tubules which elaborate special secretions. It constitutes the receptacle for the maceration, comminution and chymification of the food, which it passes intermittingly through the pylorus into the intestines, for final digestion and absorption. One of the most essential offices of the stomach is to minutely divide, as well as to thoroughly mix, the food sequence with its special secretion, the enzyme and the acid, without which the natural digestive process is materially and appreciably impaired.

For our immediate purpose we may divide the digestive process into mechanical and chemical, both being essential for the normal processes of digestion. The mechanical process appears more fixed, and requires less disturbance to produce symptoms than the chemical, although the great elasticity of the latter may overcome defects of the former. At the stages of digestion the whole product may be acted upon by microörganisms and rendered not only unfit for use but actually poisonous.

Immediately food enters the stomach the fundus commences to enlarge, and is followed by expansion

of the whole cardia. This expansion continues upward to the left toward the diaphragm, displacing the coils of the transverse colon, which lie here when the stomach is empty. The pyloric portion, consisting of the antral and pre-antral thirds, remains contracted until the active part of digestion begins. According to Cannon the food is gradually squeezed out of the fundus into the churning process in the antrum through a tube-like formation of the middle or pre-antral segment, along which peristaltic contractions pass, about three to the minute Moritz says. Finally the pylorus opens at irregular intervals allowing the liquid portion to pass into the intestine, while the solid particles are returned to the antrum for further liquefaction. These processes are repeated by the contraction of the circular fibers and by the gradual shortening of the longitudinal fibers of the stomach, until it is entirely empty. "An important result of the shortening of the stomach as it empties, is the change of position of the most dependent part. The greater curvature of the stomach in the cadaver or in a living person relaxed in anesthesia commonly reaches a point considerably lower than the pylorus. But the shape and position of the stomach under such circumstances are not the same in the functioning organ. Observation with the Roentgen rays on the normal stomach containing food mixed with bismuth sub-nitrate proves that the shortening of the stomach takes place just as if the longitudinal and oblique passing over the surfaces to the greater curvature lifted the organ up to the one fixed point of the contracting fibers—the cardia. Since the pylorus is more or less fixed, it does not rise with the rest of the stomach. These observations with the *x*-ray confirm those made prior by Jonnesco and Bettman, that the pylorus, during the last stages of digestion, is the most dependent portion of the stomach and that the greater curvature forms an angle of about 45 degrees with the horizontal and

sagittal planes, while the anterior or lesser curvature is still more oblique. The consequence is that in the last stages of digestion when the gastric contents are more fluid than in the earlier processes, the pylorus becomes the lowest point in the stomach, and the contents therefore do not have to be moved upward in order to pass into the intestine."

Weisker and Kelling contend that the intra-abdominal pressure, both inside as well as surrounding the stomach and intestines, is practicallv the same, i. e., atmospheric. "That the pressure in any part of the passive alimentary canal depends upon the weight of the overlying organs. If the canal is inactive the food therefore is as if surrounded by water. Gravity cannot act and gravity drainage does not occur."

Food is pushed from the stomach, as it is pushed elsewhere in the alimentary canal, by peristalsis due to contraction of the muscles in the walls of the canal. Pressure is greater near the pylorus than anywhere else in the stomach, and the food leaves through the pylorus, even the partially obstructed pylorus, rather than through an open stoma some distance away. (Cannon and Blake.)

To the thinking surgeon these facts must naturally give rise to the question as to how the operation of gastro-enterostomy so favorably exploited for the cure of gastric ulcer and hemorrhage effects a cure. Perhaps much of the beneficial effect of this operation results from rest in bed, careful feeding, and lessened irritation to the ulcer-bearing area, with partial or complete healing of the ulcers. But in all of my cases these measures had been tried many times with no lasting benefit, before an operation was resorted to. In view of the information we have, the curative effects of this operation cannot be attributed to drainage of the stomach or to short-circuiting of the food current, as is so often contended, for unless the pylorus is closed food will continue to pass through it.

The explanation that I have arrived at, is to the effect that the cutting of the muscular fibers in the pyloric end of the stomach, does away to a considerable extent with the muscular unrest accompanying gastric digestion, especially where ulceration is present. To my way of thinking a gastro-enterostomy or a pyloroplasty acts much the same as the cutting of the fibers of the sphincter ani in fissure of the anus. In this latter condition the feces continue to pass over the ulcer, but the paralyzed sphincter by preventing friction favors rapid healing.

DISCUSSION

Dr. J. W. Andrews, of Mankato, Minn.—I have done gastro-enterostomy several times for the relief of non-malignant disease of the stomach, and once for malignant disease, and lost my patient.

In regard to the anterior operation and the use of the Murphy button, following the teaching of Dr. W. J. Mayo, of adopting the posterior operation and dispensing with the use of the Murphy button, I have found the latter operation but very little, if any, more difficult, than the anterior operation, and the use of the Murphy button but little facilitating the operation. I wish to relate two cases that I have had recently, one about six weeks ago, which was followed by unpleasant symptoms. The patient did nicely until I began giving him solid food, when he began to vomit and bile accumulated in the stomach, and there were symptoms of partial obstruction. I temporized with him a few days. Unpleasant as it was, I thought I would have to do another operation, and I did, and found it difficult because of the attachment to the omentum. I made an entero-enterostomy, which should have been performed in the first place. I left about nine inches of the gut on the proximal end of the loop. The patient made a rather unpleasant convalescence from the second operation, but he subsequently left the hospital in good condition.

The other operation was performed about two weeks ago. This time I did what I hesitated to do because of the teaching I had received on the subject, namely, the short-loop operation, originated and advocated by Dr. W. J. Mayo, and written up by him in the October number of the Journal of the American Medical Association. I made the short operation with little hesitancy, leaving only enough of the jejunum

from the junction of the duodenum and jejunum to avoid any stretching or tension. In all my gastro-enterostomies I have never had a patient get along so nicely: there was no accumulation of bile in the stomach, no vomiting, no pain, no unpleasant symptoms. It is now two weeks since the operation was done, and before I left home the patient was taking a considerable amount of solid food. This was my first short operation, but I have been remarkably well pleased with it. Understand, I did not change the course, did not twist the jejunum so as to correspond with the peristalsis of the stomach, but brought it right up in the position that it naturally lies.

DR. GROUND (closing the discussion).—I had several cases that I reported in my paper, but, of course, time would not permit of reading them. But my experience in the last two years with surgery of the stomach has been seven operations for chronic ulcer of the stomach, and in three of them the symptoms pointed to ulcer, but no ulcer was found. I made an anastomosis, and they seemed to get along as well as those in whom ulcer was demonstrated. All of the patients recovered but one. This patient was a man who on the fifth day after operation was given a heavy meal of grapes and milk by his wife, and he developed peritonitis in a day or two, and died on the eleventh day. That was the only death following simple gastric ulcer. I have had one case of duodenal ulcer that came too late for any operation, although I opened the abdomen. I mentioned one case of adhesions of the stomach, and one of hemorrhage. In four cases I resorted to anastamosis for malignant obstruction of the pylorus. One of these patients with malignant disease died the next day, and one died in about a month; the rest of them are all alive. In one case I made a posterior gastro-enterostomy where there was persistent vomiting. A marked feature of this man's trouble before operation was vomiting. I opened the abdomen, and did a Finney operation, and although the patient survived the operation, the case is too recent to say what the ultimate outcome will be. We know from the experiments of Cannon and Blake, that it is possible to make the current of food go through the anastomotic opening, but if there is any patency of the pylorus the food will go through it. I think it is much the same as when we get healing of a rectal ulcer by cutting the sphincter muscle.

I think we may sever the fibers in the pyloric end of the stomach, and in that way avoid ulcer, putting the part at rest; and that accounts for the good results obtained in ulcer of the stomach.

PRE-OPERATIVE THROMBI IN THE REGION OF THE FIELD OF OPERATION AS A CAUSE OF POST-OPERATIVE COMPLICATION AND DEATH

A. W. Abbott, M. D.

MINNEAPOLIS, MINNESOTA

I cannot find that this subject has ever been brought before this Association, but believe that it is of sufficient importance to command our attention.

The pathology of thrombosis, and the dangers from resulting embolism, metastatic abscess, septicemia, pyemia, and secondary hemorrhage have been carefully studied since the time of Virchow, and are thoroughly appreciated by the profession.

This paper will discuss only those thrombi which already exist in the immediate neighborhood of an operation. I shall take the liberty of redirecting your attention to some well-established conclusions which bear directly upon my subject.

Thoma states that "there are infective diseases which frequently cause thrombosis in the absence of other morbid processes; the infective thrombus may therefore be regarded as a well-marked and frequently occurring form. Among these may be especially mentioned suppurations in the neighborhood, which more or less involve the walls of the arteries and veins."

"If suppuration makes its way to the vessel-wall from without, and this leads to purulent infiltration, a thrombus forms in the lumen of the vessel. This is then infected from without, and undergoes puriform softening. This also occurs if suppuration develops in an

already thrombosed vessel." "As a rule, this form of thrombus is infiltrated with micro-organisms, so that it becomes an important means of general infection."

Virchow, in 1855, demonstrated that "when the vessel-wall is inflamed it may suppurate, or even abscesses form, which cause the outer wall to bulge on both sides without any coagulation of the blood ensuing in the cavity of the vessel. At other times, phlebitis is the cause of thrombosis, in consequence of the formation of irregularities and even ulcerations upon the inner wall."

From the above we learn (and this may be corroborated by any surgeon if he will carefully observe) that thrombophlebitis is common in inflamed areas; that if the vessel-wall is inflamed the vessel may or may not be thrombosed; and that in either case it is a source of great danger.

I would add that thromboses are common after extensive contusions and lacerations of the soft parts. In deep phlegmonous inflammation it is the rule that deep incisions produce only the slightest bleeding. The infected vessels are not only thrombosed, but compressed by the tissue tension.

We may also bear in mind that in inflamed areas the tissues are more or less fixed; the vessels are not readily pushed out of the way, and are not easily discovered. The vessels are likely, therefore, to be cut or torn, or violently disturbed. A vessel in which there is a clot is more likely to become infected during an operation, than one whose lumen is open, because if the thrombosed vessel is open it remains open, and hence exposed to germ invasion, while the sound vessel bleeds, washes away infective material, and is immediately closed by the surgeon.

The only distinguishing symptom of thrombosis in regions where operations are likely to be performed is edema. and as there is no edema where the collateral circulation is abundant, it follows that only in the

extremities, especially the lower, may this symptom be of service in diagnosis. Pain is obscured by the pain of the growth or causative inflammation.

Dilatation of the collateral veins is usually present, but usually of no diagnostic advantage, as these vessels are ordinarily not superficial. My attention was first directly called to this condition in 1880. In repairing a laceration of the perineum, I cut open several thrombosed veins, some of them an eighth of an inch in diameter. My technic was not as aseptic as it should have been, and no further attention was given to the thrombi. The wound was not perceptibly infected, but the patient died in forty-eight hours, of well-marked septicemia. Since that time I have seen several cases where vessels of considerable size, in the field of operation, were thrombosed: the thoracic veins, the deep epigastric veins in large appendiceal abscesses, and many times thromboses in the lacerated perineum. Thrombi are common in the lateral sinus from mastoid disease, and are often seen in the broad ligaments, and more commonly than elsewhere in the infected uterine walls.

Traumatism, malignant disease, and tuberculosis may cause thrombosis in the renal veins. Thrombosis of the mesenteric veins, especially the superior, with extention to the portal vein, follows volvulus, ulcer, cancer, and other diseases of the bowels. Portal thrombosis follows gastric ulcer, cancer, blows on the abdomen, and intestinal disease. The deep epigastric veins are often thrombosed in appendicitis. In 131 cases of appendicitis, Dr. Halsted reports four cases of thrombosis of the femoral veins. The iliac veins are also sometimes involved.

The dangers of thrombosis following operations have been well studied, and are appreciated by the medical profession, but with the exception of thrombi of the cerebral sinuses in connection with ear suppurations which have been thoroughly worked out by the aural

surgeons, I believe that too little attention has been given to thrombus which may be disturbed or infected by operations or may materially affect the prognosis of the operation.

We all recognize the risk of embolism, especially pulmonary, of infection of the clot, of blood infection from the organisms in the clot. How far does this knowledge affect our methods? and are there any practical ways of lessening the dangers incident to the condition?—are questions of importance. I believe that many cases of fatal sepsis, pulmonary embolism, and particularly many cases of so-called ether pneumonia, can be rightly ascribed to the infection of a clotted vein or its disturbance by rough handling, or both, that are otherwise inexplicable; so, also, pyemia, abscess of the liver, osteomyelitis, and other evidences of metastatic infection.

If these damages are real, how can we avoid or minimize them? Aural surgeons have formulated a definite operation for thrombi of the lateral and sigmoid sinuses; viz., ligation of the internal jugular vein and clearance and drainage of the sinuses.

This is an eminently successful operation, considering the desperate condition which calls for the interference, and is, so far as I know, the only established operation for thrombosis complicating operations.

I believe that a similar course should be pursued, as far as possible, in all operations complicated by thrombosis. Unfortunately, the existence of complicating thrombus is not as a rule, as easily discovered in other operations. In the gastric and hepatic regions the thrombosed veins are likely to be hidden by adhesions or by the organs themselves. In kidneys requiring operations, the vessels are the last tissues to come in view and touch. In appendicitis the mesenteric veins are often in forbidden territory, on account of the fear of the dissemination of septic material; and for the same reason the iliac veins are not likely to be

touched or sought. The deep epigastric veins are only to be felt or seen by wider dissection than is customary. Thromboses after lacerations and contusions are generally deeply out of sight in the tissues. However, like other abnormal conditions, we shall detect them with a frequency in proportion to the intelligent search we may institute for them.

In operations for new growths, obstructive conditions, perforations, and wounds in the abdominal cavity, thrombosis may be more readily detected; so, also, in the pelvic veins and perineum.

The rule may be laid down that, in cases where the collateral circulation is adequate, the thrombosed veins should be excised or ligated centrally. Long ago Baumgarten proved that if a medium-sized vessel is carefully ligatured the blood-stream is brought to a standstill as far as the nearest collateral branch, but no thrombus is formed unless the intima is ruptured. If the collateral supply is inadequate, resect, if possible, the necrosed tissues with the thrombosed vessels which supply or drain it.

If the conditions are such that these methods cannot be adopted, let the vessels alone, especially by disturbing as little as possible the tissues in their vicinity. Forcing the clot out of its bed and infecting the clot by cut or puncture afford the great danger from rough and incautious treatment of the neighboring tissues. In some cases this condition would be a valid argument against the too early getting up of a patient after operation.

In following out these rules, the results have been satisfactory in the majority of cases while in some the outcome has not been all that could be desired. It is also to be taken into consideration that a recovery following the excision or ligation of thrombosed veins is not always a demonstration that recovery would not have taken place without the intervention. Nevertheless, from the fact that in one case of appendiceal ab-

scess I was able to trace a general infection directly to a puriform thrombophlebitis of the right deep epigastric vein, and, in the case cited above, to the thrombi in the perineum, and also in one case of appendicitis, in which I made the prognosis of a fatal result from septic embolic pneumonia, there being pus in the deep epigastric vein, it is fair to presume that recovery was assisted in other cases by the precautions taken in this regard. Of course, where necrosed tissue has been excised along with the thrombosed vessel, as, for instance, in the bowel, the credit for the recovery should undoubtedly be given to the intervention.

It is evident from our journals that thromboses are lately receiving more attention than formerly. Elliott, in November, 1905, Annals of Surgery, reports five successful excisions for mesenteric thrombus. Monro, in the same number, calls attention to subphrenic and hepatic abscess, due in some cases to mesenteric thrombus following appendicitis.

The intention of this paper is to go back one step further, and inquire whether we may not, by early operations, by special care in handling of the tissues, or by excision or ligation, prevent, in some measure, these very conditions which call for desperate intervention or result in death.

In certain cases there may be some satisfaction, if we recognize, during operation, a puriform thrombophlebitis that we cannot control, and that must inevitably prove fatal, in preparing the friends for the event, as well as in taking the onus from the operation itself.

DISCUSSION

Dr. Henry T. Byford, of Chicago.—I want to call your attention to one point, namely, that since our antiseptic and aseptic methods have improved we have very few cases of thrombi. The secret of the whole thing lies in asepsis.

Dr. Abbott (closing the discussion).—I want to say that the cases referred to by Dr. Byford are not of the type mentioned in my paper. The cases I referred to are those in which thrombi have already existed at the time operation was made, but my paper had no reference to what comes after.

CONSERVATISM IN POST-OPERATIVE TREATMENT

By S. C. Beede, M. D.

DAVID CITY, NEBRASKA

From a time when the memory of man runneth not to the contrary, the fountain of eternal youth has been diligently searched for. Humanity seeks not only perpetual existence and longer life, but the easy way to both. In ancient times all tribes and nations, seeing the certainty of mortality, turned their thoughts to the possibility of a future existence, and formulated the multitude of religious theories that in their modified forms are with us to-day in their power for good and evil. The modern mind, more practical, concerns itself less with the possibilities of a future life, and seeks rather to lengthen mortal existence and to ameliorate its pains and hardships. Thus has sprung up a class of men whose object and aim it is to minister to suffering mortals in their afflictions, and lead them in ways that will lengthen their tenure of the only thing of which we have positive knowledge, the present existence. It is not strange that among this class there should be fanatics and mercenaries, nor that the wisest and purest should be led astray in their enthusiasm for the best that can be attained. Neither is it strange, or deplorable, that there should be emulation and rivalry among this class of men. It is only when this rivalry leads to the indulgence of unwise hazard that it works harm.

The division of this class that is represented here to-day, the surgeons of the great West, has little cause to deplore fanaticism in its own ranks, and can con-

gratulate itself that about the evils resulting from the mercenary spirit it has no great cause for anxiety. There are few in our profession who are influenced by visionary theories, and few that allow their judgment to be warped by the greed of gain. All, however, are influenced by the worthy motive of doing better what others do well, of pointing out ways that have not heretofore been used, and devising modifications of procedure that will give better results than have been heretofore attained. Success in these naturally attract to the surgeon more people who wish to avail themselves of his skill, and it has come to be considered that the number of patients he has is the measure of his dexterity. We all desire success, and we all desire to be considered successful. Therefore we are all influenced in our recommendations by the desire to appear successful. This leads to many unfortunate practices that interfere with the best effort for the patient, and cast reflection upon our profession. It is notorious that surgeons' reports of cases are misleading as to results, because cases are so often reported as cured that have only recovered from the effects of the operative trauma. This has been condemned for years, in editorials and society discussions, and the condemnation should be continued from all quarters till no operation will be recommended as curative until the post-operative history of a sufficient number of cases subjected to it has proven the results ample in benefit to warrant the procedure.

It is that a plea may be entered for conservatism in one matter of post-operative management that I ask your indulgence for a moment to-day. The plea may not be well grounded or may not be of sufficient importance to merit consideration. If so, condemn it; but if, on the other hand, my contention is right—if, as I believe, harm is being wrought upon our patients and even the best workers represented here to-day

rendered liable to just censure—do not cast it aside lightly, but give it the consideration it deserves.

I refer to the increasing tendency among surgeons to hasten their patients out of bed and hospital after grave operations. My attention was first directed to this matter when members of the laity began to mention frequently the shortness of time patients were detained by this and that surgeon. Nurses would speak with pride of the fact that their favorite operator would send a hernia or an appendix case home in two weeks. Then another one, not to be outdone, made it twelve days, instead of the fourteen. Another, to make a better showing than his competitor, shortened the period of disability to ten days, only to be met by a more daring rival with an eight-day period for a clean abdominal section. We all know that *this* is not the limit of extravagance in this strife to make it appear easy to be operated upon, but that patients, after extensive abdominal work, have been taken out of bed and placed in a chair on the third day, and allowed to walk about the room on the fourth.

It is indeed creditable that the many weeks in bed once necessary can now be avoided by more perfect technic, especially in the matters of more perfect control of hemorrhage, aseptic precautions, discarding irritating antiseptics, avoiding unnecessary traumatism, and care in suturing and suture tension. These give the best possible opportunity for nature to do her reparative work, but nature will work only so fast, and there is a limit in time beyond which it is unsafe to urge her. My contention is that this limit has been overstepped, and that the perfect result which should be the aim in every case is thereby marred.

The fact that harm was being done by not confining the patient to his bed a sufficient length of time was first suspected by me in connection with my own work. I had thought that if it was not necessary to keep patients quiet as long as had been customary that *my*

patients should have the benefit of the shortened period. In common with the rest, I did not want to be too far behind in the procession, and so followed the lead of my ideal surgeons. It soon became noticeable, however, that late wound suppuration was occurring more frequently than formerly. Patients that had developed no abnormal temperature, and had been discharged with dry and healthy appearing scars at the end of twelve or fourteen days, would return later with them tender, swollen, or suppurating. At first it was thought to be due to using chromacized catgut. This was discarded, but the cases continued to return with annoying regularity. Redoubled watchfulness of technic failed to change materially the unfavorable percentage. About this time a medical friend, in the course of conversation, remarked that of ten cases of abdominal section he had sent to a most excellent surgeon who is an advocate of shortening the time of detention in hospital, six had suppurating wounds, four of them being cases of late suppuration. We discussed at some length the possible causes of this large percentage of suppurative sequelæ in clean cases. The conviction settled upon our minds that it is a mistake to hurry patients out of bed. Another unfortunate operative sequela near this time brought the matter home to me with such force as to at least partly excuse any undue heat that may be exhibited in this paper. A young woman, a trained nurse, had suffered for several months with pain in the right groin. An operation was done upon her by a competent surgeon who removed a chronically inflamed appendix about which a few adhesions had formed, but in which no evidence of pus was present. She left the hospital with an afrebrile convalescence on the eighth day after her operation, and within a week she had developed a fibrinous peritonitis from the effects of which she suffers to this day, more than a year after her operative traumatism. It is difficult not to believe that this case

would have been well and strong if she had remained in bed another week or ten days with proper care and diet.

Reference to basic principles should remind us of the folly of this haste. From the beginning of surgical teaching, rest has been the first requirement of treatment. To secure rest is nature's first requirement in the reparative process. We hope to improve upon nature, but we must do it by aiding her processes, not by acting contrary to her plain teaching.

In the repair of wounds nature throws out an exudate to splint the parts and supply adhesive material for the union of divided tissues. Part of this exudate is organized, and becomes new tissue. Part of it is of use only to act as a splint to secure rest. This unused portion is gradually absorbed, but not until after many days or weeks. We aid nature by taking away and keeping out materials whose presence adds to nature's work. We approximate the separated parts in their natural position, tissue to tissue, without undue tension by means of sutures, obliterating as far as possible all dead spaces. We use bandages and splints to aid in securing rest, and we put the whole body as nearly as possible at absolute rest, that all the vital energy available may be directed to the reparative work. We limit the diet to avoid the strain and toxins of indigestion. Now, when this work is but well begun, is it wise to put the patient on his feet and help undo what we have been so assiduously endeavoring to do?

Late wound suppuration has been mentioned as one of the results of insufficient detention. From the beginning of repair until it is wholly completed, nature wages war against morbific germs that in spite of all our efforts always gain access to the weakened tissues. The skin harbors them, defying water, friction, and chemicals. The blood is likely to carry some, and the air is seldom so thinly inhabited by them as not to

deposit a few on the battle field. Is it not poor strategy to demolish the fortifications and withdraw a part of the forces when the most dreaded enemy, pyogenic bacteria, is just getting his second wind? For he *is* rallying at about the time the over-enthusiastic surgeon turns his patient out into the world? If readily absorbable suture material has been used, it is then in that gelatinous state most favorable for invigorating the spores of certain germs that are seldom destroyed completely in the process of sterilization. If non-absorbable sutures have been selected they have just been removed, dragging in their wake some of the reserve of the enemy that have been gamboling in the deeper layers of the epithelium. If firm sutures remain, unnecessary movement causes them to pull upon the yet tender tissues from which escape blood or serum, that, stagnated, furnishes the pabulum upon which they thrive so well.

It seems hardly necessary to remind you that a scar at the end of a week is not very firm, however favorable the progress of its formation may have been. Recalling your observations in secondary operations at this period when it was necessary to separate the newly united surfaces is sufficient. Can we expect otherwise, then, than to have thin, weak scars resulting and hernias more common as sequelæ? As a matter of fact is the average patient any sooner able to resume his duties by hurrying him from the hospital before firm union can have occurred? It certainly is not if his occupation is active. Irritating a healthy wound will not make it heal any faster. If it retards it, the period of disability is lengthened. The expression, shortening the period of disability, is unfortunate in this connection when used in any other sense than that of hastening the process of repair by improving technic.

If convalescence were shortened, as a rule, by hastening a patient out of bed, he still could not afford to take the risk of the occasional bad result. The ac-

tual value of time to the average patient as represented by his average daily earnings is very small, and the amount lost by an extra week's detention in hospital is insignificant. If he is in a condition serious enough to warrant surgical procedure, he is sick enough to spend the time necessary to secure the best result. The surgeon has no more right to give his patient less than the best possible chance for the best possible result in this than he has in any other part of his treatment.

UNDESCENDED TESTICLE

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The importance of this subject was first given prominence by John Hunter, who described the normal descent of the testicle in the fetus, and mentioned some of the abnormalities in the descent of the organ. Curling, in 1866, in his work on "Diseases of the Testicle," dwelt especially on this condition. An elaborate publication of the Hunter lectures on the "Imperfectly Descended Testicle" was gotten out by W. McAdam Eccles.

Nothing of any importance in the way of discovery as regards cause and treatment, has been published until within the last quarter of a century, and since the treatment has been greatly modified the subject of undescended testicle has again become prominent. Very little is to be found in the ordinary text-books at the present day on this topic, most of the literature being found in recent medical journals.

Descent of Testicle.—The testicle begins its descent about the sixth month, and should reach the scrotum at about the eighth month, and unless it is found in that space, according to Monsorrat, between the second and third year, the deformity is likely to be permanent. Curling places the limit at one year.

The gubernaculum, situated posteriorly to the vaginal process, is composed of a fold of peritoneum and muscle tissue derived from the abdominal muscles. It extends through the inguinal canal, and assists in guiding or coaxing the testicle into the scrotum. A finger-like process of peritoneum (vaginal process) accompanies the gubernaculum, and precedes the testicle in

the scrotum. This sac is obliterated soon after birth in its funicular portion, and forms the tunica vaginalis of the testicle.

Causes of Undescended Testicle.—An undescended testicle may be due to one or more causes. We are as likely to get an undeveloped condition of a testicle or its associated and essential parts, as of any other portion of the body. Should there be an undeveloped or rudimentary testicle, other tissues dependent upon that organ's development, may not develop, as the vaginal process, scrotum, epididymis, or vas deferens.

An elongated mesorchium may allow the testicle to wander beyond its regular course of descent, and become misplaced or attached to other tissue. Inflammation in or around a testicle during its migratory stage, may result in adhesions to the peritoneum, bladder, or intestine. A limited opening of the inguinal canal, according to Curling, is a potent factor in preventing a proper descent of the testicle, as well as pressure due to a truss worn in case of a hernia.

One of the divisions of the gubernaculum may draw the testicle into an abnormal position at times, or a hernia may so displace the testicle as to prevent its entering the vaginal process.

Frequency.—This abnormality is frequently encountered when operating for an inguinal hernia. Batchelor, in operating 125 herniæ, found this complication four times.

Marshall in examining 10,800 recruits discovered 12 cases: 1 double, 5 right, and 6 left.

Sach in an examination of 143 male infants (one to four months old) found 14 per cent of cryptorchids, 12 being double.

Wrisburg in 103 male infants at birth found 30 per cent with one or both testicles partially descended.

In 12 cases one or both testicles were still retained in the abdomen. Three weeks later 10 of these 12 were found in normal position.

Remues found only 6 cases in 3,600 French recruits, one being bilateral. Recruits for the Austrian army showed 1 in 500.

Thus we see that the abnormality occurs often enough to demand a proper consideration. In 48,000 males Eccles reports 854 cases of imperfectly descended testicles (1 in every 56).

Variety.—The testicle may be found at any place from its primary location within the abdomen to a point just outside the external abdominal ring. One or both may be found within the abdomen, or one partially descended and the other within the abdomen. When ectopic it may be found in Scarpa's triangle at the root of the penis or upon the aponeurosis of the external oblique. At times it may be located just under the pubic bone.

Non-descent or partial descent occurs more frequently on the right side. In rare cases the testicle may work its way between the peritoneum and transversalis fascia, and emerge through the femoral ring (crural testicle).

Complications and Results of Undescended Testicle.—An undescended testicle may cause no inconvenience before puberty. The period of development may result in additional congestion and some inflammation of the organ, and when the gland is located in an abnormal position, pressure symptoms and adhesions occasionally result.

At puberty the organ may be normal, and have all its parts, but owing to its abnormal position, it is unable to proceed along the natural course of development. In consequence of the improper supply of blood and pressure of surrounding tissue, a retrograde process takes place, leaving the patient practically eunuchoid. Sterility is the usual result in a cryptorchid, as has been found by a number of investigators. The microscope has failed to find the spermatozoön in a number of instances. However,

some are able to beget one or more children if marriage is early.

The testicle, occupying a point just within the internal ring, or canal, prevents the canal from closing, resulting in an actual or potential hernia. Eccles reports 35 per cent of hernia occurring with undescended testicle in one year. In fact a diagnosis of undescended testicle has been made in some case only at the time of operation for a strangulated hernia, a condition frequently seen in these cases. Sometimes a hernia may be found in the upper part of the funicular process and a hydrocele below, with a constriction between. (Courtney.)

The microscopic findings in an undescended testicle show the tubules fewer in number and smaller in size, separated by connective tissue. The gland itself is found soft and small, 5 per cent only being normal. Microscopically it has been found in undescended testicle of the adult that the interstitial cells are present, that the tunica albuginea is thickened, and the lumen of the tubules nearly obliterated.

Little or no work has been done to show what effect the present method of early restoring these organs to their normal location has upon their development as indicated by the microscope. It is reasonable to suppose that many of the findings in cases not operated upon, would not obtain if treated according to recent surgical methods.

Hunter and Curling both believe the abnormal position alone is responsible for the retrograde change in these organs after puberty, and they are of the opinion that they are perfect organs up to that time.

Neuralgia, inflammation, tubercular trouble. sarcoma, gangrene, abscess, peritonitis, and torsion, are also possible consequences of a retained or partially descended testicle.

SYMPTOMS AND DIAGNOSIS

The symptoms of undescended testicle are often those of the complications. No particular complaint is made until the patient reaches the period where he becomes conscious of his unlikeness to other male children; or when, because of hernia, pressure, torsion, inflammation, constriction of the circulation, or sarcomatous involvement, the condition is discovered.

A posterior urethritis, extending to the epididymis, results in severe pain, due to the unyielding nature of the surrounding organs, and may cause the patient to seek a physician. A severe cough, or injury from lifting, is likely to cause trouble in these individuals.

The diagnosis is only difficult in the very young, where the gland may be held tightly by the cremasteric muscle close to the external ring or in the canal. It is quite important that every male child should be carefully examined, when possible, in early childhood life, to ascertain the presence of undescended testicle or not, in order that the proper surgical treatment might be instituted early, and thereby avoid the physical and mental distresses later of these unfortunates.

Errors in diagnosis may be attributed to carelessness, and no doubt many cases have been passed over hastily by physicians without a thorough examination or a thought of the possibility of this abnormality. The complications present may be very confusing in some cases, especially where severe inflammatory trouble is present, or malignancy, hernia, or other complications are associated with an undescended testicle.

TREATMENT

The treatment of undescended testicle varies with the age of the patient, the presence or absence of complications, and the severity of the symptoms in a given case. At one time an undescended testicle was

either removed when it caused trouble, or was returned to the abdomen. During the last half century the subject has been given greater attention. It has been within the last ten years that the operation has been perfected, so that it is now found unnecessary to sacrifice these organs, and is possible to restore them to their proper abiding place when nature does not do so. Reduction often insures the patient against atrophy, malignancy, degeneration, and hernia. If unsuccessful, the patient is no worse off than before. Formerly when a hernia co-existed, if a truss could not be worn a soft pad and bandage took its place. These appliances seemed to increase the possibility of inflammation or other complications, as well as to prevent the descent of the testicle.

E. M. Corner believes that orchidectomy is only justifiable in torsion, severe neuralgia, and atrophy, or other special pathological conditions, but he believes replacement within the abdomen should be performed before puberty if at all.

Gould states that the testicle should be given a chance to develop by fixing it in the scrotum in early childhood.

Eccles says the rule therefore should be to bring the testicle into the scrotum if possible; if not, to return it to the abdomen.

The first operation to correct the position of an undescended testicle was performed by Koch of Munich in 1820.

Some surgeons have fixed the testicle beneath a skin flap of the thigh to prevent its retraction.

Kietley reports 25 cases treated in this manner for five months after which the gland with the gubernaculum was separated and placed in the scrotum, of these cases 12 are right, 2 left, and 5 double.

In certain cases, especially in adults of mature age, when there has existed a great deal of inflammation or pain, with swelling or atrophy, it is advisable to

remove the testicle for fear of more serious complications, and then too at this time there may be no hope of restoring the gland to its normal condition.

When tumors, fibrous or otherwise, exist, an orchidectomy is indicated. When a torsion of the cord occurs, operation is imperative and may demand a sacrifice of the gland. Inflammation, present or past, size of organ, age of patient, and complications present are all determining factors in the treatment of the case.

The first work along the line of the present form of operation was done by Max Schüller in 1881. He recognized the influence of the vaginal process in the retraction of the testicle after operation, and advocated the division of the vaginal process and stitching the testicle in the scrotum.

Mignon found by severing all the vessels and leaving the vas deferens intact, that the testicle could be brought into the scrotum. The shortness of the vessels prevented this procedure when intact. Some authors report atrophy of the organ when these vessels have been severed in some instances.

Routier and Kiermisson believe the spermatic vessels essential for the integrity of the testicle, and advise against their ligation.

Griffith demonstrated that the spermatic vessels could be safely sacrificed.

Results of Operation.—Bozy reports a case operated on six years earlier, in which the testis and virility are apparently normal.

Brocha operated upon 138 cases, 79 of which were followed for one year; 31 were normal in size and position; 35 normal in size, but high in scrotum; and 13 were atrophied, all of them being in growing children. This shows a great contrast with operative result in adults, and argues well for early operations.

Odiorne and Simmons published an extensive article on this subject. The following is the summary of

their cases reported: Orchidopexy was performed 7 times in children, with 2 perfect results; 11 operations in adults from 16 to 42 years of age; 5 testicles remain in scrotum, 4 of them in high position; 1 perfect result as far as position is concerned, but ½ normal size, yet subject to injury and resulting inflammation; 3 retracted within canal and atrophied greatly. In every case where the testicle was normal in size at operation, great diminution resulted. Inflammation, neuralgia, etc., were some of the consequences, but the herniæ were cured. In four cases in adults, where the testicle was placed in the abdomen, there was a tendency for the testicle to come down, causing pain and necessitating a truss in one case. Three cases, including double and single undescended testicle in the canal, gave perfect results as far as relief from symptoms were concerned.

From the above report we would conclude that an operation upon adults for bringing the testicle into the scrotum was useless.

To Bevan more than to any other surgeon perhaps belongs the credit of placing the operation for undescended testicle on a true scientific and practical basis. His explanation of the various steps of the operation are so clearly described and illustrated that I will not take time and space here to again describe it in detail, but will call your attention to his article published in the Journal of the A. M. A., Sept. 19, 1905.

Some of the points in the operation I would, however, emphasize with some modification of Dr. Bevan's plan.

1. The vaginal process should be ligated high up in the canal.

2. A purse-string suture should close the vaginal process above the testicle.

3. The cord and testicle should be thoroughly dissected from the vaginal process and the other tissues

high up within the abdomen, leaving nothing but the vas deferens and vessels.

4. Sufficient tension should be put on the cord to bring the testicle well onto the thigh, viz., three or four inches below Poupart's ligament.

5. A pocket should be made in the scrotum by stretching the tissues with the fingers.

6. The testicle should be fastened as low in the scrotum as possible, or by a purse-string suture of chromicized catgut, including the tissue above the testicle and beneath the skin of the scrotum.

7. A suture should bring the pillars of the external ring firmly together above the cord.

8. The canal should be closed above the cord and the conjoined tendon brought below Poupart's ligament. For this I have preferred the U-sutures of silkworm gut coming through the skin and tied over gauze.

9. The spermatic vessels may have to be sacrificed, especially in a retained testis, in order to bring the gland down far enough.

CONCLUSIONS

1. All male children should be carefully examined to determine the presence or absence of the testes within the scrotum.

2. The testicle is necessary for virility and masculinity.

3. When undescended, the testicle is prone to become malignant, and it is liable to injury or may atrophy.

4. When an undescended testicle is discovered in a child above five years of age, it should be brought down into its normal location by operation.

5. A cryptorchid is usually sterile, unless the testicles are brought down in the scrotum before puberty.

6. By a thorough and painstaking operation an

undescended testicle can be brought into the scrotum and made to remain there permanently.

7. Testicles brought down into the scrotum have an opportunity to develop more perfectly, because of the avoidance of pressure of the surrounding organs.

8. The frequency of malignancy, tubercular inflammation, traumatic disturbances, as well as an associated hernia are all arguments for an early operation.

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DISCUSSION

Dr. Joseph Rilus Eastman, of Indianapolis, Ind.—I wish to add a few remarks to the conclusions of the essayist. I believe that these ectopic testes should be brought down into their proper position. I think the step enunciated by Dr. Bevan and emphasized by the essayist, relative to the closing of the external abdominal ring after placing the testis in the scrotum, is an important one. It is extremely important after the testis has been turned out-of-doors that it should

be kept there, and the doors closed behind by the closure of the external abdominal ring.

A few months ago I noticed a report by some Frenchman of a method he had adopted to secure the testis in the scrotum after it was placed there, which consisted in passing a catgut ligature through the scrotum from without inward, then through the fibrous tunic of the testis and back again, so that it is kept in its proper position. This catgut is looped and fastened to an adhesive strap, and will hold the testis down, the adhesive strap and suture being left in for a couple of weeks. I had also used this plan several times. The testes remained in the position in which they were placed.

That the ectopic testis may be brought down easily if done early was demonstrated to me by a case operated within a month, a child of three years. If the operation is done early, it is not difficult to draw down the testis, and put it in the scrotum where it belongs; but if we wait until the child grows up there will be such adhesions and such growth of the tissues binding the testis down in its abnormal position, in the abdomen, that it will be difficult to draw it down. The keynote is to get the case early, and bring the gland down while there is still a possibility of doing it well and easily. In young children, so far as my limited experience teaches, it is easy to bring the testis into the scrotum. I have been greatly surprised to find how relaxed were the tissues of the cord and how easily the little embryonal testis might be drawn down and placed in the scrotum. I operated on one of these cases by passing the skin sutures in such a way through the connective tissue of the cord high up, that when tied the tendency would be for the skin suture to make traction downward upon the cord. No doubt most of you who have operated for ectopic testis have inserted the skin suture in such a way through the skin up through the connective tissue of the cord, and down lower through the skin again, so that when tied it would draw the spermatic cord and stretch it along the inguinal canal, taking strain off the catgut ligature which was fastened to the lower pole of the testis and tied to the adhesive plaster surrounding the thigh.

Dr. Benjamin (closing the discussion).—There are one or two points I am glad Dr. Eastman brought out, particularly the one with reference to the placing of the suture. That is practically the method I have employed. In one case I brought the suture out through the skin of the scrotum and held the testicle down. A better way, I think, for holding the testicle down than with the adhesive plaster attached to

the suture, is to place a dressing around the scrotum of gauze, attaching the adhesive plaster over that, making no tension on the suture, because if there is any tension, or much tension, on the suture it will cause damage to the tissues, while with the broader surface made by the use of the gauze and adhesive plaster we can accomplish the purpose. This is only a modification of the method formerly employed of fastening the testicle underneath the flap on the thigh; afterwards this attachment was severed and the gubernaculum with the testicle, was placed down in the scrotum.

Another point which Dr. Eastman brought out, and which I was glad to hear, was with reference to early operation in these cases. One of the cases I operated on was eighteen months old. This is one of my most satisfactory cases. The operation was easy to do, with the testis being practically within the abdomen. The earlier we do these operations the easier they are to do. No complications have arisen from traumatism on account of the misplacement, and the organ will show a much better development in future years than if the operation is done later. If you are careful to loosen up adhesions around the cord to get the organ so that it will lie three inches below Poupart's ligament on the thigh, it will remain in place more easily. You may have occasionally to sever the spermatic vessels; but if you do a very early operation, with thorough dissection, I do not think that will be often necessary.

GUN-SHOT WOUNDS OF STOMACH, WITH REPORT OF THREE CASES

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SIOUX CITY, IOWA

Penetrating wounds of the abdominal cavity are particularly dangerous on account of wounding some of the viscera or dividing blood vessels. Bullets passing through the abdominal cavity can hardly fail to wound some of the viscera, doing serious injury. The small intestines are most apt to be wounded.

There is a considerable difference in the statements of frequency of injury to other abdominal organs.

Bergmann says that in 146 cases collected in German literature of gunshot injuries received in time of peace, 19 per cent were wounds of the abdominal walls alone, 28 per cent of the small intestines, 24 per cent of the liver, 24 per cent of the stomach, 19 per cent of the large intestines, 12.3 per cent of the spleen, 0.2 per cent of the pancreas, and 0.13 per cent of the gall-bladder.

Fischer's army statistics show wounds of intestines 60.9 per cent, liver 16 per cent, stomach 7.4 per cent, spleen 2.7 per cent, and pancreas 0.4 per cent.

Siegel records 225 cases of penetrating wounds of the abdomen, as follows: stomach 33.3 per cent, duodenum 28.5 per cent, liver 16.5 per cent, and other organs 7.1 per cent. From these statistics the average per cent of injury to the stomach is 21.6 per cent.

Douglas states that 6.6 per cent of all wounds coming under treatment are penetrating wounds of the abdomen.

Fenner says that from January, 1892, to January, 1901, inclusive, laparatomy was performed in the Charity Hospital in New Orleans 113 times for gun-shot wounds of the abdomen.

It is claimed that only 3 per cent of penetrating wounds of the abdomen fail to injure some viscus. It must be remembered that the part of the trunk entered by the bullet does not warrant the conclusion that it has not entered the abdominal cavity. It may travel through the thorax and enter the abdomen. McCraw gives his opinion as to the possible deviation of the course of the bullet after entering the abdominal cavity by contact with soft tissue as follows: "I am very much inclined to the belief that the whole doctrine of balls glancing from soft tissue is a fable, founded upon imperfect observation and wrong deductions."

The literature upon injuries of the stomach is meager and indefinite as to the character, location and complications. Our text-books give us practically nothing. The character of the wound to the stomach and its location are, in my opinion, very important factors in treatment and prognosis. If the stomach is empty, the wound is less dangerous. The number of cases occurring in army statistics of recovery without operation is attributed to the fact of the stomach being empty. I think we can add to this mistaken diagnosis. From one authority you can get the statement that gunshot wounds of the stomach can safely go without operation. From another you are informed that 90 per cent die if not operated upon. This very wide divergence of teaching can only be explained by indefinite observation or unreliable information.

The symptoms of injury to the stomach are in some cases easily interpreted, but in others there may be much difficulty in making a diagnosis. All wounds involving the peritoneum are attended with shock,

which may be slight or very pronounced. Persistent shock usually means continuous hemorrhage. Vomiting usually occurs. Hematemesis is common; however, the patient may vomit blood without a perforating injury to the stomach. A rapid, compressible pulse, subnormal temperature, sighing respiration, great restlessness with free perspiration, indicates internal hemorrhage. Pain may or may not be present, and is not a reliable symptom. Emphysema may be present. A marked rigidity of the abdominal muscles is usually present. The presence of gas free in the peritoneal cavity is a very important symptom and is positive evidence of perforation of a hollow viscus. This is manifest by the absence of liver dulness. The presence of fluid free in the abdominal cavity must not alone be taken as evidence of internal hemorrhage, as it may be fluid from the stomach or small intestines. Signs of peritonitis may be present.

Gulzinski says that when there is free gas in the peritoneal cavity the cardiac and respiratory sounds are more distinctly heard than usual. The stomach being empty, the location of the wound may give but few symptoms.

In all cases of penetrating wounds of the abdomen, operate at the earliest possible moment, except that the shock is so profound that death is almost certain. Douglas says to operate if the patient is conscious, and pupils not dilated, though pulseless.

The lack of proper assistance or the environment of the patient may deter the surgeon from operating. The statistics show that in wounds of the stomach the earlier the operation is done the greater percentage of recoveries. In cases operated upon within four hours the mortality is 15.2 per cent, from 5 to 8 hours 48 per cent, after 12 hours 70 per cent. Rustowzen reports the mortality as 24 per cent with operation and 25 per cent without operation. These were cases in civil life, but the time of operation after

receipt of injury is not given, and the statement of 25 per cent mortality without operation seems almost incredible.

There is a difference of opinion as to advisability of operation after peritonitis has commenced. Except when peritonitis is well advanced I would advise operation. We must expect to influence prognosis, collapse, infection, and secondary hemorrhage, either into the stomach or abdominal cavity,—infection causing peritonitis, local gangrene, pneumonia, thrombosis, and embolism. Douglas reports ten cases occurring between the years 1895 to 1900 with seven recoveries and three deaths. I have had three cases.

Case 1.—O. W., aged 19; weapon, revolver 48 caliber; accidentally shot. Point of entrance three inches to the right, and two inches above umbilicus. I reached the patient one hour after the receipt of the injury. He died in a few minutes. The post-mortem revealed a large amount of blood in the abdominal cavity, which came from the wound in the coronal artery, the bullet passing through the cardiac end of the stomach high up.

Case 2.—Young man, 18 years old, was cleaning a revolver supposing it was not loaded. Weapon discharged, the ball passing into the abdominal cavity. Point of entrance, two inches to left and a little below the umbilicus. Accident occurred between 9 and 10 o'clock P. M. At time of accident he was in a small house alone; shortly afterwards he walked to a neighbor's half a mile distant. Dr. Frear of Sloan, Ia., was sent for. I reached the patient at 7:30 A.M. of the next day. There had been no vomiting, and the patient was suffering but little pain and slight shock. Pulse was 98, fairly good, and the temperature normal. The patient had been given whiskey and water pretty freely before Dr. Frear reached him. There was evidence of fluid within the abdominal cavity. The patient was sure that he held the revolver in such

a position that the course of the bullet would be downward and outward toward the right hip from the point of entrance. The patient was anesthetized with chloroform, and a small incision was made along the edge of the left rectus muscle commencing near the umbilicus. As soon as the peritoneum was incised a free escape of fluid took place which had the odor of whiskey. The incision was rapidly enlarged upward and the liquid removed with gauze sponges. The wound was in the anterior wall of the stomach about midway in transverse and long diameters. The patient suddenly died from effects of the chloroform. Further examination showed a wound of the posterior wall on a line somewhat higher. There were no intestinal lesions.

Case 3.—W. J., aged 12, injured August 20, 1904, by a bullet from a 22 rifle. The point of entrance was two inches to the left and one and one-half inches above the umbilicus. It lodged under the skin of the abdominal wall, three inches to the right of the median line in line with the border of the umbilicus. The patient was visited by Dr. Johnson, of this city, who had him removed to the St. Joseph's Hospital. I saw him at 6. P. M., and found him suffering from shock, pulse 120, temperature subnormal, body covered with perspiration. He vomited freely, the contents of stomach being mixed with blood. While undergoing the anesthetic, ether being used, he vomited quite a large amount of fluid, freely mixed with blood. A median incision was made from below the ensiform cartilage to the umbilicus. I found the wound in the anterior wall of the stomach. The point of entrance was about two inches in front of the cardiac curvature, and the point of exit was near the pylorus with quite an area of ecchymosis. There was some transudation from this wound. Both wounds were closed with two layers of Lembert sutures, fine silk thread being used. While under the anesthesia, the stomach was washed out,

removing a considerable amount of blood. The wound through the abdominal wall was trimmed and closed. The abdomen was closed without drainage. He was very restless and had some temperature for three days, after which he rapidly recovered.

From a total of 132 cases of simple and complicated gunshot injury to the stomach, I find 54 cases of injury only to the stomach. All were operated upon within 24 hours, and of the number the result is not given in two cases. In 52 cases we have 31 recoveries, or 59.6 per cent with twenty-one deaths, or 40.3 per cent. When the operation was within 6 hours, the recoveries numbered 22, or 66.6 per cent, and deaths 11, or 30.3 per cent. After six hours to 22 hours there were 5 recoveries and 5 deaths, or 50 per cent for each.

In the series of complicated cases, we have 4 cases not operated upon, and all died. This leaves 75 cases operated upon, resulting as follows: recoveries 28, or 38.6 per cent; deaths 47, or 62.6 per cent. Adding 4 cases not operated upon gives a total of 79 cases with 51 deaths, or 68 per cent.

Cases operated upon within 6 hours give 22 recoveries, or 51.2 per cent, and 19 deaths, or 46.3 per cent.

After six hours to 32 hours there were 6 recoveries, or 26 per cent, and 17 deaths, or 73.9 per cent.

One case operated upon at five days died. In cases where time is not given there was 1 recovery and 7 deaths.

Location of stomach wound in simple cases: posterior wall, 1; anterior wall, 23; both walls, 22; large curvature, 2; small curvature, 1; not indicated, 4.

In two cases operated upon, and no wound found, death took place. At post-mortem examination perforating wounds of stomach found. Wounds present, but not found at time of operation, 12.

In complicated cases I find other viscera injured in frequency as follows: liver 37; small intestines 25, and of these duodenum 6, jejunum 9, ileum 10, colon 18, transverse 13, descending 2, part not indicated 3; kidney 11, of these the left 6 times, right once, not given 4; pancreas 10; mesentery 9; lungs 9; spleen 8; blood vessels 7; pleura 4; omentum 3; gall-bladder 3.

One is surprised to find the omentum mentioned as injured but three times when it must have been injured in almost all of the cases.

Moyneham attributes the favorable result given without operation in penetrating wounds of the abdomen in the South African war to the small-sized bullets and great velocity, producing cleavage rather than actual destruction of the tissues. No leakage occurring in wounds of the stomach and intestines, healing occurred without complication. The lessons of war, however, have no application in civil practice. With a large bullet we have less velocity, hence large destruction of tissue.

It will be noted that the percentage obtained from an analysis of this series of cases is quite at variance with that given by other writers.

One fact is well established, whether in simple or complicated cases, and that is that the earlier the operation is performed the greater is the percentage of recoveries. In civil practice this one rule should never be disregarded.

Wounds of the anterior wall are most common, and that seems to be less dangerous than wounds perforating both the anterior and posterior walls. The amount of hemorrhage will influence the prognosis. The technic of treating wounds of the stomach walls is somewhat in dispute. The principal difference of opinion among surgeons is as to whether the edges of the wound shall be trimmed. It has been the practice not to trim the edges of the wound as some devitalized tissue surrounds the wound it seems to me

good surgical sense to remove this tissue; and as wounds in other portions of the body are treated with removal of all devitalized tissue before closure, I can see no valid reason why like treatment should not be adopted here. There will be less liability of infection and secondary hemorrhage or giving way of the sutures allowing leakage of the stomach contents into the peritoneal cavity. If drainage is deemed necessary it should be from the lower part of the abdomen with elevation of the body of the patient, Fowler's position.

I believe the careful sponging out of the soiled abdominal cavity with gauze sponges moistened with a hot saline solution better than flushing the cavity with a salt solution. However each case must be judged by the condition present as to the indication for treatment.

Case 1.—Time between injury and operation: 17 hours. Lapar: bullet wounded post, stomach wall only; no peritonitis; suture. Operator: Adrassy. Result: Recovery.

Case 2.—Boy; 11 years. Gun caliber 32. Accident, wound at junction of seventh rib and cartilage. Time between injury and operation: Five hours. Infra—umbilical median lapar; large anterior clot of blood in abdomen cavity; perforated anterior wall stomach; closed fine silk Lembert sutures; cone shaped wound under surface of liver; closed, deeply buried and loosely drawn cat-gut sutures. Exploratory opening gastro-colic omentum; wound post. wall. stomach; closed similarly Lembert. Abdomen mopped out with sponge pads, but not flushed; exterior wound closed. Operator. J. W. Andrews. Result: Was well three days; died on fifth day. Postmortem: septic peritonitis.

Case 3.—Male; 31 years. Wound in fifth intercostal. Time between injury and operation: nine hours; median supra-umbil. lap.; blood in abdominal cavity, but no food; small perforations on small curvature of stomach, with ragged edges bleeding; suture passing through all layers of stomach and over this a second row of seroserous sutures. Complication: wound also diaphragm, pleura, and liver. Gastrocolic omentum split, search for post. wound, not found; near cardia ecchymotic zone; ligation of a blood vessel. Closure of abdo-

men. Operator: Auvray. Died 3½ hours later of ante-operation hemorrhage. Autopsy: bullet found in stomach; a 5-6 C. M. erosion upon post. wall, gastric mucosa.

Case 4.—Male; 20 years. Revolver of small caliber wound; a little outside of left sternal border. Time between injury and operation: several hours. Supra-umbilical median lap, with lateral incision, parallel to left costal arch; perforated anterior, wall stomach, high near small curvature; protusio mucosæ gastralis; hemorrhage from wound; no food in peritoneal cavity; two rows of suture; one through and one sero-serous; opening of lesser cavity by splitting mesentery; no post. perforation, but ecchymosis high up, near cardia; closure of epiploic split; gastrotomy not done, mucosa not searched, patient not standing well the chloroform. Injection two litres of serum during operation. Operator: Auvray; patient died eight hours later. Autopsy: diaphragm and liver found also wounded.

Case 5.—Male; 21 years. Epigastrium; midway between umbilicus and costal border, two cm. to left of median line. Bullet left in back at 10th intercostal space, 10 cm. from median line. Time between injury and operation: Five hours.

Hole in anterior wall of stomach; escape of gas; suture coplic. Profuse hemorrhage from wound in gastrohepatico omentum; two large clamps applied; hemorrhage continues; tamponage. Operator: Bazy. Results: Recovery.

Case 6.—Boy; 4 years. Abdomen. Time between injury and operation: 22 hours. Lapar: small stomach wound suture; localized peritonitis. Operator: O. Bergstrom. Results. Recovery.

Case 7.—Male; 31 years. Calibre of gun, 31. Bullet struck a button on the uniform. Wound: five cm. to left of median line and same distance above umbilicus. Time between injury and operation: four hours. Median supra-umbilical laparotomy; odor of stomach contents on opening abd. cavity; hole ant. wall stomach exit wound duodenum, five cm. below pylorus; stomach wound at equal distance from each curvature, with ragged edges; edges trimmed; closed; Lembert suture; stomach cont. in abd. cavity; perit. lavage, hot water; drainage at duoden. Complications: one mentioned, one new wound in duodenum, one 3 cm. wound jejunum, 50 cm. from jejunoduodenal angle. Operator: Bernays. Recovery. Obs.: bullet expelled per vias naturales a few days later.

Case 8.—Male; 22 years. Revolver 32 cal. Wound: two

fingers above umbilicus, one finger to right of med. line. Time between injury and operation; 16 hours. Lap.; inc. from xyphoid to umbilicus; perf. round, ant. wall stomach, two fingers from umbilicus; Lembert sutures with five threads of silk; post. wall wound near small curv.; blood and stomach contents removed; return of intestines under great difficulty. Time, one hour. Complications: retroperitoneal hematoma; bullet lodged in head of pancreas. Operator: Bernays. Died three days later. Autopsy: duodenum perf. near head of pancreas; right renal vein and small artery severed; large hematoma near kidney; generalized peritonitis.

Case 9.—Male; 30 years. Revolver 7 mm. cal. Wound: left parasternal over 8th rib. Sound takes downward and backward direction. Time between injury and operation: one and ½ hours after. Lap.; large amt. blood in abd. cavity; double perf. stomach; coronary art. severed; ligature; suture. Time: one and ½ hours. Operator: Bertram. Result: died 24 hours later. Post-mort: spleen and left kidney injured.

Case 10.—63 years. Wound: 7th interspace, below nipple. Time between injury and operation: 32 hours. Trans. incision, from linea alba to 6th, 7th and 8th ribs, which are resected; ant. wall stomach wound; liver, aorta, kidney also wounded; 29 sutures; bullet found in right kidney; peritonitis. Operator: Billroth. Result: died.

Case 11.—Male; 11 years; 22 cal. rifle. Wound: fifth intercostal space, left side next to mammary line. Time between injury and operation: eight hours. Traverse posterior aspect of fundus, point of exit being in the dependant part of the greater curvature. Wound of the pancreas. Both gastric wounds closed by a purse-string suture. Operator: W. Jepson. Result: recovery.

Case 12.—Female; 34 years. 32 revolver. Time between injury and operation; six hours. Incision six fingers long; large quantity of blood and some stercoracious material in abdomen cavity; wound ant. wall stomach. Complications: Two wounds in jejunum, two in transv. colon. Operator: Bolles. Result: Died four hours later.

Case 13.—Male; 25 years. 32 cal. gun. Wound: through right rectus m. at level of umbilicus. Time between injury and operation, one hour. Lapar.: ant. and post. wall stomach, traversed, one inch from greater curv., two from pylorus; closed Czerny-Lembert sutures; perit. flushed; abd. closed

without drainage. Operator: R. R. Bolton. Results: Recovery. Observations: feeding by mouth on 6th day.

Case 14.—Male; 14 years. Wound in right middle linea semilunaris, 3 inc. below margin of 10th rib. Time between injury and operation, 3 hours. Lapar. over wound; peritoneum, intestines in neighborhood of wound congested; blood in perit. cavity; 2 perf. intestine (jejunum),—one perit. wound of same intestine, 2 wounds of its mesentery, no other wound apparent; closed each Czerny-Lembert sutures; abd. flushed hot dist. water ext. wound closed with glass drainage. Operator: C. C. Booth. Result: died next day of shock and hemorrhage. Observations: Necropsy; free bile in upper abd.,—about 6 oz. blood clots in hollow of sacrum; 2 holes through greater curv. stomach, 2 holes ant. surface gall bladder; 2 perf. abd. aorta, opposite umbilicus; bullet not found.

Case 15.—Female; 28 years. Wound in eighth rib; two fingers of left chondrocostal border. Time between injury and operation, two hours. Vertical incision over wound and a transv. incision along costal border; wound ant. wall stomach near large tuberosity eversion of gastric mucosa; two rows of suture. Wound post. wall near cardia, through which food (cabbage) passes out; sutured under difficulties; with iodoformed gauze. Time: 1½ hours. Operator: Bougle.

Case 16.—Male. 4-5 hours after last meal. Wound: beneath costal arch near margin of left eleventh rib. Exit wound a little farther below first. Time between injury and operation, five hours. Left lateral laparotomy, ant. wall of stomach wound in super. portion of large curvature; prolapsus mucosæ gastralis; large epiploon split between two clamps to search for post. wound; same as ant. wound. Both closed with sutures. Complications: bullet penetrated pancreas and probably the vertebral column. Pancreatic wound tamponed. No intestinal lesion. (Escape of pancreatic liquid through wound.) Operator: Bramman. Result: recovery in six weeks.

Case 17.—Boy; 16 years. Gun caliber 32. Wound: epigastrium. Time between injury and operation, immediately. Supra-umbil. median lapar. blood in perit. cavity; stomach distended, ant. wall two wounds,—one at junction of middle with outer third, and one near pylorus; small amt. fluid escapes; gall bladder wounded, some bile out; liver perf.; cont. Lembert sutures; a rent in transv. colon. Two

days later second lapar.; escape of bile through rent in liver; packing with iodoform gauze; salt sol. irrigations; abd. closed, with drainage. Operator, C. E. Brewer. Result: recovery.

Case 18.—Male; 21 years. Wound: 2 in. to right and 1 in. above umbilicus. Time between injury and operation: immediately. Median lapar.; free fluid and clotted blood in abd. cavity; oval, ragged wound ant. wall stomach, near pylorus, with protusio mucosæ; closed with two layers Lembert; transv. mesocolon split, post. wall searched, but no lesion found; normal salt perit. douche; abd. closed with two cigarette drains. Operator, G. E. Brewer. Result: recovery.

Case 19.—Female. Wound: 3½ fingers above umbilicus, ½ finger to left of med. line. Time between injury and operation, 18 hours. Median supra-umbilical lap., inc. carried down to a point midway between umbilicus and os pubis; two holes large curv. stomach, near epiploic. insertion; escape of lacteous liquid from perit. cavity; sutures; drainage of lesser cavity with gauze. Operator: Briddan. Result: died of infection. Note. tentamen suicidii. Autopsy: 4 other interesting wounds discovered.

Case 20.—Male. Small cal. rev. Wound; epigastric region. Time between injury and operation, one and one-half hours. Median incision; two stomach perf., contents escaped. Blood in stomach. Complications: Diaphragm and pleura perforated; lung damaged and bleeding. Operator: Dr. Brueck. Result: died on following day. Observations: hemorrhage. Postmortem: hemorrhage.

Case 21.—Male; 45 yrs. Gun caliber 22. Wound: three fingers below and four fingers to left of umbilicus. Time between injury and operation: three hours. Median laparotomy; wound on ant. wall of stomach; sutured; exist wound not searched, so as not to prolong operation. Operator: Cabot. Result: recovery.

Case 22.—Female. Revolver. Wound: ninth left intercostal. Time between injury and operation: not indicated. Perforation of ant. wall of stomach with protusion of mucosa. Double row sutures. Examination of post-stomach wall negative. Operator: Cazin. Result: recovery. Observations: expulsion of bullet on 8th day per vias naturales.

Case 23.—Girl; 16 yrs. Wound: 2 inc. left of umbilicus, midway between it and 9th costal cartilage. Exit wound at right side of trans. process of 12th dorsal. Time between injury and operation: 2 hours. Lapar. over entrance wound;

1¼ inc. irreg. wound in large curv. of stomach, close to reflection of omentum; closed. Lembert sutures; no other visceral lesion; ext. wound closed. Operator: J. W. Cousin. Result: recovery.

Case 24.—Revolver. Wound in epigastrium. Time between injury and operation: not indicated. Lapar.: double perf. stomach; local peritonitis; sutures; perit. washing; wound large intestine,—four perf. small intestine, sutures. Operator: Cerne. Result: died. Note: large and small intestine lesions recognized only post-mort.

Case 25.—Wound: sixth intercostal space, two fingers to left of sternum. Time between injury and operation: six hours. Median laparotomy; stomach contents in abd. cavity; two wounds in ant. wall stomach, near large curvature; closed with sutures. Duration; 45 minutes. Operator: Dalton. Result: died.

Case 26.—Male; 22 yrs. Small pist., cal. 38. Wound: five fingers to left and five fingers above umbilicus. Time between injury and operation: 24 hrs. Med. supra-umbil. lap.; stomach wound near border of pylorus; another wound at superior border; three points of Lembert sutures on first, four on second wound; and flushed with ster. aqua. Time: two hours. Complic.; wound, form of V on ant. surface of left lobe of liver; catgut sutures; contusion wound on sup. wall of transv. colon. Operator: Dalton. Result: recovery. Observations: slight hyoscyamus poisoning; food given on 10th day.

Case 27.—Male; 25 yrs. Wound: external to right of middle line, about one cm. from free border of ribs. Time between injury and operation: stated to be a short time. Lapar.; two perf. stomach sutured; wound ant. edge of liver packed iodoform gauze; abd. drained through drainage tube every hour. Operator: N. P. Dandridge; Rep. by J. C. Oliver. Result: died second day.

Case 28.—Bullet. Wound: hypogastrium. Not operated upon. Expectant treatment. Bullet passed through stomach near cardiac orifice. Operator: Dartigues. Result: died. Observations: necropsy,—besides stomach, liver pericardium, and pleura wounded; stomach wound in a place beyond surgical interference.

Case 29.—Male; 34 yrs. Time between injury and operation: not indicated. Lapar.; stomach, closure of ant. wall hole, also one of post. wound near pylorus, latter reached by

splitting mesocolon transv.; suture of 2 holes in transv. colon; closure of ext. wound. Operator: Delatour F. Beckmann. Result: died on fifth day with delirium tremens. Observations: autopsy 7th day revealed nothing wrong in abdomen.

Case 30.—Male; 21 yrs. Time between injury and operation: 7 hours. Lapar.; ant. stomach wound, 1½ cm., closure with 6 step like sutures; wound of spleen, tamponade; drain. post abd. cavity; ext. wound closed. Bullet not found. Operator: Demoulin. Result: recovery.

Case 31.—Female; 21 yrs. Gun calibre: 8 mm. Wound: beneath costal border at external border of left rectus. Time between injury and operation: two hours. Ether narcosis; median, infra umbilical laparotomy; one liter of blood removed from abd. cavity; blood mixed with a yellowish liquid exit noisily from stomach hole, situated two fingers above cardia. Complic.; 7 cm. wound in spleen 3 cm. from its inf. margin; bleeds profusely; sutured. Operator: Demoulin. Result: recovery. Observations: Tentamen suicidii.

Case 32.—Female; 22 yrs. Wound: between 9th and 10th rib on a line with ext. mammilary line. Time between injury and operation: nine hours. Chloroform; median supra-umbilical lap.; escape of large quantity of clotted blood from abd. cavity. Stomach dil.; wound ant. wall, six cm. below cardia, one cm. long, 1½ cm. broad; wound edges trimmed; two rows of Lembert sutures. Bullet believed to lodge in liver; 10 cm. transv. inc. in this organ; stomach pushed to left; colon pushed down; profound hemorrhage discovered; source, contusion wound of liver, between Spigelius lobe and left border; gauze tampons and drainage clear through ext. wound. Abdomen rapidly closed. Duration; ¾ of hour. Operator: Dubujaddony. Result: recovery.

Case 33.—Male; 20 yrs. Gun calibre: 7 mm. Wound: three fingers from costal margin at equal distance between xyphoid and umbilicus. Time between injury and operation: one hour. Lateral laparotomy; incision paral with left costal arch. A 5 cm. wound in ant. wall stomach closed with Lembert sutures. Abd. cavity not soiled. Complic.; wounded transv. colon; no contents out; Lembert sutures. Operator: Flammerdinghe. Result: recovery. Observations: tentamen suicidii. Post-oper. anesthetic bronchitis.

Case 34.—Young man. Gun calibre: 7 mm. Wound: epigastrium. Time between injury and operation: one hour. Lapar.; ant. wall stomach, wound; closed suture; post. wall and everything else, normal; ext. wound closed without drain.

Operators: E. Forgue and E. Jeanbrau. Result: was well two days; died on 2d day. Observations: post-mort.; bullet injured without penetrating, mucosa on post. wall of stomach, and secondary hemorrhage ensued.

Case 35.—Male; 19 yrs. Rev. 7 mm. ½ hour after last meal. Wound: below and to left of umbilicus. Time between injury and operation: 1½ hrs. Laterovertical laparotomy, inc. passing through entrance wound. Perf. ant. wall of stomach a hand's breadth from cardia, and left of small curvature. No st. contents; no blood in abdominal cavity. Stomach distended with food and gases; sutures. Gastrocolonic epiploon split,—no perfer nor ecchymosis found on post. wall of stomach. Closure of abd. without drainage. Artificial serum. Hypo morph. ¼ centigr. every hour, whole afternoon. Operator: Forgue. Result: died on third day. Observations: abundant hematemesis before death, and signs of collapse.

Case 36.—Gun calibre: 7 mm. Time between injury and operation: one hour. Lapar. ant. wall stomach wound; sutured; bullet was believed to have lodged in stomach. Operator: Forgues. Result: hematemesis, and death on third day. Observations: post-mort. bullet in stomach, had caused traumatic inflamm. on post. wall stomach, with consequent fatal hemorrhage.

Case 37.—Male; 44 yrs. Revolver. Wound: 5th left intercostal, near sternum. Time between injury and operation: oper. on fifth day after injury. Lap.; wound in stomach, and in liver; sutures. Operator: Gabszewicz. Result: died next day of peritonitis. Observations: autopsy; bullet had penetrated lung, diaphragm; wounded stomach, twice transv. colon and lodged in pancreas.

Case 38.—Male; 25 yrs. Gun calibre: rev. 9 mm. Wound: intersection of 7th intercostal and mammillary lines. Bullet leit between 11th and 12th ribs, near vertebral column, beneath skin. Time between injury and operation: not indicated. Laparotomy; wound 3 cm. post. margin of large curvature; protusio mucosæ gastralis through wound; escape through it of stomach contents and blood; sutures in two rows. Peritoneal toilet with tampons of sublimated gauze. Perforation of diaphragm admitting finger. Operator: Gabszewicz. Result: recovery; discharged on the 7th day.

Case 39.—Woman; 30 yrs. Pistol, 32 cal. Wound: 3 inc. above Poupart's lig., 1 inc. to right of median line. Time between injury and operation: 2 hrs. Supra-umbilical lapar.;

escape of gas from abd.; stomach ant. wall perf.; closed 9 fine silk Lembert sutures; no other wounds found; perit. cleaned with steril. sponges; abd. wound closed with strip of iodoform drain. Operator: A. H. Garrat. Result: recovery.

Case 40.—Male; 26 yrs. Wound: 7th intercostal, 3 fingers from median line. Time between injury and operation: "next day." Eleven hours. Extraction of bullet, then lapar.; cavity filled with bloody liquid; otherwise nothing wrong. Operators: Glantennay and Lardennois. Result: died on same evening (11 hrs. after oper.). Observations: necropsy; hematoma in ant. mediastinum; stomach perf. from side to side; kidney perf. from ant. surface to hilum, cause of fatal hemorrhage.

Case 41.—Male; 51 yrs. Revolver. Wound: precordial region. Time between injury and operation: "operated upon within four hours." Lapar.; abd. blood but no clots; left lobe liver perf. from side to side; on convex surface a stellate wound larger than ½ dollar piece, with long anteroposterior fissures; wound ant. wall stomach near small curv.; coronary art. wounded; ligature; transv. mesocolon split post. wall wound lower and to left; no gastr. contents in abd. cavity; sutures of each wound; strong catgut sutures in form of U for liver; ext. wound closed with Mikulicz drainage. Operators: Glantenay and Neveu. Result: died next day. Observations: post-mort. ant. surface of left kidney normal,—but post surface damaged.

Case 42.—Male; 21 yrs. Wound: left part of abdomen. Time between injury and operation: eight hours. Lapar.; hole admitting two fingers, pyloric region of stomach, ant. wall; covered with graft from mesocolon by 122 points. Complic.; two perf. descending colon, 11 perf. small int.; escape of food. Operator: Griffith. Result: died 11½ hours later without regaining consciousness. Observations: stomach hole could not have been sutured at that place without causing pyloric stenosis.

Case 43.—Male. Wound: postaxillary line midway between iliac crest and costal margin. Time between injury and operation: 21 hours. Lapar.; perf. stomach and transv. colon sutured. Operator: W. S. Halstead, reported by Cap. Ch. E. Flagg.

Case 44.—Male. Wound: 5th interspace, near costal cartilage. Time between injury and operation: 4 hours. Lapar.;

2 stomach perf.; sutured. Operator: W. S. Halstead, reported by Capt. Flagg. Result: recovery.

Case 45.—Female; 36 years. Bullet 7 mm. Wound: intersection of left mammillary line and 8th intercostal. Time between injury and operation: two and one-half hours. Left lateral laparotomy; hemorrhagic wound ant. wall of stomach, size of bullet; no prolapsus mucosæ; suture; splitting of gastrocolic omentum and opening of lesser cavity; here, operation was hurried on account of grave condition of patient, without looking for exit wound. Collection of blood over muscles of spinal column. Drainage of lesser cavity with iodoform gauze; suture of abdominal walls. Operator: Herzfeld. Result: recovery. Observations: post. oper. rectal alimentation 4 days; then per. mouth. Left purulent pleurisy. Duration: two months.

Case 46.—Wound: inf. left part of abdomen; bullet left under skin near xyphoid. Time between injury and operation: immediately. Lateral laparotomy; stomach wound sutured; wound in large intestine also sutured. Operator: Huntington. Result: recovery.

Case 47.—Suicide. Operation refused. Operator: A. A. Ignatow. Result: died 22 hours later. Necropsy; two perf. stomach; liver wounded on its ant. marg.; stomach contents in abdomen.

Case 48.—Female; 25 years. 7 mm. cal., revolver held on skin. Wound: beneath costal border, 4 cm. from median line, 9 cm. from umbilicus. Time between injury and operation: three hours. Median supra-umbilical laparotomy. Oval wound on small curvature of stomach above cardia, long axis of wound directed upward and to left, measuring 1½ cm.; wound gaping, permitting cavity of stomach to be seen; coronary artery severed; profuse hemorrhage; suture of mucosa with catgut; ligature of artery; Lembert suture with fine silk over first suture. Operator: Jalaquier. Result: recovery in two months.

Case 49.—Male; 45 years. Wound; right epigastrium; exit wound over left spina posterio-superior ilei. Time between injury and operation: 1¾ hours. Lapar.; one wound ant. wall stomach near small curv.; one post. wall near large curv. both closed with purse string sutures, and over these. 5 matress sutures; to reach post. stomach wall gastrocolic lig. was split. Complic.: hole in mesentery, with profuse hemorrhage; hole in mesocolon descendens and in jejunum, with damaging of

serosa jejunalis in another place; abd. cav. filled with stomach and intestinal contents; washed hot nor. salt sol., gauze drain; inf. of saltol.; fearing intest. necrosis abd. opened on 5th day; nothing. Operator: Johnson. Result: recovery.

Case 50.—Female; Mulatto; 18 years. Gun calibre: 32. Wound: abdomen, near median line. Time between injury and operation: a few hours later. Median lapar.; two inc. wound, large curv. stomach; contents out; some bleeding; closed interrupted Lembert sutures; liver perf. one inc. from lower edge of right lobe bleeding profusely; catgut suture; abd. wound closed without drainage. Operator: R. W. Johnson. Result: recovered in 21 days.

Case 51.—Male; 25 years. Wound: 1½ finger's breadth from sternal line, and 1½ from costal arch, to left. Time between injury and operation: two hours. Laparotomy; food exit through ext. wound.; stomach traversed from side to side; contents in perit. cavity; suture; peritoneal toilette. Compl.; bullet traversed through left lobe liver, tail of pancreas; wounded spleen, pierced diaphragm; suture of diaphragmatic and hepatic holes. Operator: Kalinowski. Result: died 24 hours later of peritonitis.

Case 52.—Female; 28 years. Gun calibre: 7 mm. Wound: 2 fingers above to right umbilicus. Time between injury and operation: 6 hours. Median laparot.; wound ant. wall stomach, 5 cm. from pylorus near large curv.; escape of fl. contents; double row cont. silk sutures; one wound on free border and one on mes. side of intestine, similarly closed; transv. mescolon split; wound post. wall stomach, similarly closed; mescolon fastened by button sutures to the regions of stitched wounds; reposition of intest.; abd. cav. wiped with towels immersed in Hg. sol; ext. wound closed; iodoform bandage. Healing of wound by first intention. Operator: Karczewski. Result: recovery in 7 weeks.

Case 53.—Female; 18 years. Small pist. 32 cal. Wound: four fingers above and to right of umbilicus. Time between injury and operation: ten and ½ hours. Lap.; wound of pylorus; suture. Complic.: liver, kidney, and small intestine wounded; mesenteric artery and vein severed; ligatures; nephrectomy. Operator: Keen. Result: died 15 days later. Observations: aut.; general peritonitis, due to gangrene of a piece of mesentery.

Case 54.—Boy; 14 years; 6 cal. revolver, four and ½ hours after last meal. Wound: left parasternal line, over costal border. Time between injury and operation: three hours.

Laparomy; abdomen filled with red-black blood. Hot sol. of bismuth for intestines. One wound ant. wall of stomach, near large curvature, round, 1½ cm. in dia.; margins bleeding; no post. wound; bullet probably in stomach; double line of catgut sutures; over these a few interrupted Lembert silk sutures. Operator: Kocher. Result: recovery.

Case 55.—Boy. Wound: 2 cm. over umbilicus. Time between injury and operation: immediately (?). Lapar.; two wounds ant. wall stomach; two wounds transv. colon; suture; bullet not found. Operator: Koenig. Result: recovery in 11 days.

Case 56.—Male; 34 years; revolver. Time between injury and operation: 24 hours. Med. lap.; seropurulent liquid in abd.; stomach, colon, liver wounded; closed each wound sutures. Operator: Koerte. Result: died.

Case 57.—Male; 30 years; rev. 9 mm. cal. Right hypo. four cm. above umbilicus and below costal arch; exit wound below 12th rib 15 cm. to left of vertebr. col. Time between injury and operation: seven hours. Med. lap.; mixture of intest. and stomach contents with blood in perit. cavit; stomach perf. four cm. from pylorus, one cm. in diameter, with ragged borders; no protusio mucosæ; post. wall wound with protusio mucosæ gastralis; situated near insertion of gastrocolic ligament; double row of sutures; perit. washing with borated water; drainage lesser cavity iodoform gauze. Complic.: perf. liver with fissures on ant. border; two intest. holes with protusio mucosæ; two perf. jejunum; escape of contents. Operator: Kakula. Result: died 16 hours later in collapse. Aut.: pericarditis, myocarditis.

Case 58.—Boy; 15 years. Gun calibre: 15 mm. Wound: one cm. below xyphoid, 5 cm. left of median line; bullet felt 3 cm. below left border of costal arch near external border of rectus muscle. Time between injury and operation: 19 hours. (after). Chloral and chloroform; inc. over wound; stomach perf. 6 cm. above pylorus at equal distance between the two curvatures; by pressure over stomach gas and liquid escapes; closed two rows sutures; gastrocolic omentum split, a post. wall wound at a somewhat lower level, sutured; periton. drainage with iodoform gauze; a portion of epiploon injured; necrotic removal. Operator: Kukula. Result: recovery.

Case 59.—Female; 28 years; rev. 7 mm., soon after meal. Wound: two fingers above and to the right of umbilicus. Time between injury and operation: six hours after. Supra-

and infra-umbilical laparotomy; stomach dilated; one wound ant. wall 5 cm. above pylorus near large curvature. Complic.: two wounds, one on free border and one on mesenteric side of knuckle of intestine. Operator: Krajewski. Result: recovery.

Case 60.—Time between injury and operation: three hours. Lapar.; stomach and liver perforated; kidney injured; stomach and liver suture. Operator: Krajewski; reported by A. Wertheim. Result: recovery.

Case 61.—Male; 17 years; revolver. Time between injury and operation: four hours after. Stomach hole sutured; stellate wound of liver; six deep sutures; jejunum, pancreas and left kidney wounded. Operator: Kroenlein. Result: died eight hours after operation.

Case 62.—Male; 22 years. Gun calibre: 7 mm. Wound: eight left intercostal 10 cm. from median line; bullet left beneath skin at angulus scapulæ inferioris. Time between injury and operation: six hours. Chloroform; left lateral laparotomy along border costal arch; excessive intestinal tension, begin. of peritonitis; evisceration over hot compresses; stomach perforated from side to side; closure of each hole with three sutures of silk. Operator: Laurent. Result: recovery.

Case 63—Rev. 9 mm. cal. Wound: epigastric region. Time between injury and operation: seven hours. Lap.; stomach perf. 3 cm. near pylorus; bile and gastric juice in abdomen; sutures; liver penetr. near ant. border; sutures. Operators: Lambotte and Hermann. Result: died. Autopsy: ant. liver wound long Spigelius lobe perf. of aorta.

Case 64.—Male; 24 years. Gun calibre: 38. Wound: on a on a line with left nipple, 3 inc. below it. Time between injury and operation: a few hours. Ante-oper.; stomach washed out; small quant. blood found; supra- and infra- umbilical lapar.; small quantity stomach contents out; entr. wound post. wall near esophag. wall; "very hard to get at"; exit stomach wound good sized, ragged, near cardial end, purse-string fine silk suture; perit. cav. wiped dry steril. gauze; closed with drainage. Operator: F. Lawford. Result: recovery.

Case 65.—Male; 27 years; pistol. Wound: two fingers to left of linea alba, beneath ribs. Time between injury and operation: immediately. Median laparotomy; double perforation of stomach; suture. Operator: Mackie. Result: died 24 hours later; septic peritonitis.

Case 66.—Male; gun. Wound: eighth intercostal, 2 cm. from dorsal spine; exit wound left 7th intercostal, one finger's breadth from median line. Time between injury and operation: one day. Vertical 10 cm. incision, beginning at wound; stomach retracted adherent; being freed fissure is noted on small curvature; two sutures passed with difficulty; tract of bullet traceable on surface of left lobe of liver; abd. flushing dist. water; tamponage of liver wound. Immediate results good, but later fistula at external wound, with escape of food and bile and secondary hemorrhage. Operator: R. Makins. Result: died on following day.

Case 67.—Male. Wound: one cm. above and two cm. to left of umbilicus. Epiploon protudes through external wound. Time between injury and operation: not indicated. Rigorous disinfection, antiseptic dressing, later surgical intervention; incision 15 cm. long passing through ext. wound and extending 5 cm. below umbilicus; intestinal tract and mesentery found intact; abdomen closed. Operator: Melis. Result: died next day in collapse; no hematemesis. Observations: perforation ant. wall stomach near large curvature.

Case 68.—Pres. McKinley. Wound: three cm. to left of middle line, 11 cm. below arch. Lapar.; ant. and post. wall stomach penetrated; each wound stitched; some stomach contents poured out; removal with sponges; perit. flushed hot normal salt sol.; bullet not found; pulse high at first; general condition good for a few days. Result: died on 6th day, from gangrene and fat necrosis. Post mortem: suprarenals, upper pole left kidney, and pancreas wounded.

Case 69.—Female; 26 years; revolver. Wound: sixth intercostal space, 3 cm. from sternum. Time between injury and operation: 2½ hours. Median supra-umbilical laparotomy; no gases or blood in abdomen; stomach dilated; wound in ant. wall very high and very difficult to close; three rows of sutures; large mesentery split to examine post. wall; exit wound found there, at a high point on large curvature; search facilitated by an additional transverse abd. incision; closure of post. wound also with great difficulty; some oozing, probably of hepatic origin, arrested by gauze tampons. Operator: Marion. Result: recovery.

Case 70.—Male; 32 cal. gun. Time between injury and operation: 1½ hours. Lapar.; one stomach perf. sutured. Operator: Mark Heine; reported by Capt Flagg. Result: recovery.

Case 71.—Wound: mammary line, 6th left intercostal space. Time between injury and operation: not stated. Lapar.; no stomach contents in abd. cavity; stomach not reached on account of extensive adhesions (peritonitis in childhood); latter; hemato-thorax. Operator: Martens. Result: died. Post mortem: bullet passed through base of lung, diaphragm, left lobe of liver, and small curvature of stomach.

Case 72.—Female; revolver. Wound: epigastric region. Time between injury and operation: not indicated. Lap.; stomach, one ant. and one post. wound; tail of pancreas and left kidney wounded; nephrectomy; suture of pancreatic wound; through drainage. Operator: Mauclaire.

Case 73.—Wound: fifth intercostal space. Time between injury and operation: not stated. Lap.; abd. cavity filled with blood and stomach contents; stomach wounded near cardia. Operator: Mauley. Result: died two days later. Autopsy: stomach, post. wound overlooked at operation.

Case 74.—Age, 29 years; gun, cal. 32. Wound: four fingers above costal arch, 1½ fing. from median line. Time between injury and operation: not indicated. Lap.; hemorrhage into abd. cavity perf. ant. wall; mesentery and liver wounded. Operator: Mercer. Result: died 22 days later. Autopsy: stomach; post. wall perf. closed by adhesions; supurative products between liver, epiploon and diaphragm.

Case 75.—Time between injury and operation: not stated Lapar.; no injury of abd. organs found four days; later, hematemesis. Operator: Michaux; cited and reported by Demoulin. Result: died on 5th day. Post mortem: two holes in stomach, two holes in transv. colon; pancreas wounded.

Case 76.—Age, 36 years. Time between injury and operation: 1½ hours. Median laparotomy; found wounds of stomach closed. Complic.; one wound transv. colon; Lembert sutures; peritoneal lavage. Operator: Morton. Result: died during the first six hours. Post mortum: abd. in good condition; left hemo-thorax; result of injury of an intercostal.

Case 77.—Man; 32 years. Gun calibre: 22. Wound: 2 inc. outside of vetebr. column, between crest of ilium and last rib. Time between injury and operation: 2 hours. Median supra-umbil. lapar.; considerable quantity blood flows from abd. cavity; hole ant. wall stomach; air, mucus, and clotted blood flows from it; closed two rows interrupted Lembert; search post. wall abandoned; abd. closed with drainage. Operator: T. S. K. Morton. Result: recovery.

Case 78.—Male; 17 years. Time between injury and operation: 72 hours. Lap.; stomach wound sutured; suppurative collection in mesocolon; wound of liver. Operator: Mudd. Result: died.

Case 79.—Male. Wound: epigastris region. Time between injury and operation: one hour. Lap.; blood in the abd. cavity; perf. ant. wall of stomach with prolapsus mucosæ; wound also in post. wall; wounds closed with sutures; periton. lavage; drainage. Complic.: two perf. jejunum; four perf. ileum; two wounds mesentery. Operator: Mumford. Result: died six hours later. Post mortem: septicemia.

Case 80.—Male. Gun calibre: 32. Time between injury and operation: 15 hours. Lapar.; 2 perf. stomach, one large perf.; jejunum sutured. Operator: H. C. Mudd, reported by Capt. Flagg. Result: died.

Case 81.—Male; 26 years. Wound: on axillary line, beneath right costal arch. Time between injury and operation: two hours. Median laparatomy; two wounds in stomach sutured. Symptoms of opium intoxication. Operator: Murphy. Result: died in 13 hours.

Case 82.—Lapar.; two holes in stomach and duodenum; Lembert sutures. Operator: Nancrede.

Case 83.—Wound: seventh rib, 2 cm. to left of mamm. line; exit wound at back, near tenth rib. No operation. Reporter: Nifong. Result: died 53 hours after injury of shock and hemorrnage. Post mortem: perf. diaphragm, stomach, left lower lobe lung; no peritonitis; abd. cavity filled with blood.

Case 84.—Male; 21 years. Time between injury and operation: seven hours. Laparatomy; stomach contents and blood in abd. cavity; two stomach perf. sutured. Complic.; perf. diaphragm; large wound spleen; cauterized. Operator: Ohage. Result: died a few hours later. Autopsy: another stomach wound discovered.

Case 85.—Woman; 26 years. Gun calibre: 22. Wound: middle line one cm. above tip of sternum. Time between injury and operation: 1½ hours. Lapar.; fluid and clotted blood in abd. cavity; bullet had pierced left lobe liver and upper curvature stomach, a little to the pyloric side, hole admitting passage of little finger; closed 3 rows of fine silk suture; 2 quarts clotted and fluid blood removed, drainage inserted into cavity of lesser omentum in front of pancreas;

though pancreas not damaged; liver wound drainage; abd. closed. Operator: Park. Result: recovery.

Case 86.—Male; 28 years; revolver. Wound: equal distance between iliac crest and dorsal arch on axillary line. Time between injury and operation: ten and ½ hours. Left lateral lap.; blood and food abundantly in perit. cavity; contusion inf. portion large curv. of stomach; no penetration discovered; injured part covered with peritoneum, by six Lembert sutures. Complic.: spleen perforated from below upwards and backwards; several arterioles and venules being injured; removal of spleen; drainage and closure of external wound. Operator: Peyrot. Result: died two days later. (Subacute septicemia?). Autopsy; no hemorrhage, no peritonitis.

Case 87.—Male; 20 years. Wound: umbilical region. Time between injury and operation: 15-16 hours. Lap.; double perf. stomach sutured; two perf. duodenum, also two perf. transv. colon; a piece of clothing found in abdomen. Operators: Peyrot and Perier. Result: died on fourth day in collapse.

Case 88.—Male; 37 years. Gun calibre; 6 mm. Wound: 6 cm. from median line, midway between xyphoid and umbilicus. Time between injury and operation: 16 hours. Supra- and infra-umbilical lap.; inc. carried 6 cm. below umbilicus; flow of blood collected in pelvic region; evisceration to find source of profuse hemorrhage; another left lateral incision 10 cm. below umbilicus; two holes ant. wall stomach, at 6 and 15 mm. from large curv.; escape of semisolid stomach contents; closure, double row of sutures; small wound at base of gall-bladder; some gall trickling; Mikulicz dr. with iodoform g. at inf. angle of wound. Operator: Poncet. Result: died 56 hours later in collapse. Autopsy: a liver wound found; cause of hemorrhage, not noted before.

Case 89.—Young man; cal. 7 revolver. Wound: epigastrium. Time between injury and operation: 12 hours. Lapar.; closure of small wound in ant. wall stomach where a small art. was also severed. Operator: Potherat reported by Demoulin. Result: died after 36 hours, probably on account of hemorrhage.

Case 90.—Male; 24 years. Gun calibre: 9 mm. Wound: two small wounds in left hypochondrium at equal distance from xyphoid and umbilicus, near costal arch. Time between injury and operation: eight hours. Oper.; inc. from xyphoid

to a few cm. below umbilicus; one transv. incision; stomach wound ant. curv., with protusio mucosæ; no stomach contents in abd. cavity; rounding of wound margin with scissors, and suture with fine silk; second wound also ant. wall near small curv.; suture; periton. toilet; closure of ext. wound. Comp.; wound transv. colon, irregular edges; suture; collection of blood at inf. hole in left kidney. Operator: Przyborowski. Result: recovery.

Case 91.—Small pistol, cal. 22. Wound: below xyphoid, two cm. to left of linea alba. Time between injury and operation, three hours. Median supra-umbilical laparatomy; perf. of inner (?) curvature of stomach; contents pouring out; continuous suture; over this a row of Lembert sutures. Complic.: perf. left lobe liver, arterial hemorrhage stopped by deep silk sutures. Operator: Ramsay. Result: recovery.

Case 92.—Male; 51 years. Gun calibre: 22. Wound: ½ in. left of median line, 4 inc. below umbilicus. Time between injury and operation: 1½ hours. Median lapar.; fluid in abd., but no blood; ant. wall stomach ¾ inc. wound; a corresp. wound post. wall; closed cont. silk suture; abd. cav. flushed ster. water; glass drainage-tube. Operator: J. Ransohoff, reported by J. C. Oliver. Result: died 9½ hours later.

Case 93.—Soldier. Wound: level of 7th rib, medially from mammillary line; stomach-contents flow out through wound. Time between injury and operation: four hours. Wound enlarged; left pleural cavity quite filled with stomach-contents, lung collapsed; in ant. portion of diaphragm 5 cm. wound covered with omentum; reposition of omentum; sutures of diaphragm; tamponage of pleura; then lapar. through linea alb; suture of a 4 cm. wound in ant. wall stomach, near cardia; stomach-contents in abdominal cavity; iodoform drainage. Operator: Raum. Result: died next morning.

Case 94.—Male; 19 years. Gun calibre: 32. Wound: ¾ inc. above and to right of umbilicus omentum protudes. Time between injury and operation: one hour. Median infra-umbilical lapar.; abd. cav. filled with dark fl.; blood sponged out; hole in mesentery of transv. colon size quarter of a dollar, bleeding profusely; also four smaller wounds in mesentery of small intestine; each wound sutured with stout catgut sutures, purse-string silk sutures of 4 w. in small intest.; two wounds in transv. colon sutured; stomach wound same size, oval, ragged edge, sutured cont. Lembert; no other holes in stomach, perit. flushed hot sterile water; blood clots removed; abd. searched and closed with iod. gauze drain. Time:

1 hour 20 minutes. Operator: G. S. Rennis. Result: recovery.

Case 95.—Wound: left chest, 7th intercostal space, between parasternal and left mammilary lines. Septic pleuritis; not operated on. Expectant treatment. Operator: Rostowzew. Result: died eight days later. Necropsy: 2 perf. ant. wall stomach; diaphragm and left lower pulmonic lobe wounded; no peritonitis.

Case 96.—Male: 11 years; toy pistol. Wound: four cm. to left and above umbilicus; epiploic mass protrudes through wound. Time between injury and operation: five hours. Lateral laparotomy; stomach wound near large curvature; profuse hemorrhage; food in the abd. cavity; stomach wound brought to surface and gastrostomy performed. Operator: Routier. Result: died 24 hours later with temp. 39°, and delirium.

Case 97.—Male; 17 years; revolver, accident one hour aftermeal. Wound: two wounds, size of 25-cent piece, left of median line, 1 cm. below umbilicus; distance between them, 1 cm. Time between injury and operation: five hours and ¼. Supra-umbilical median laparotomy. Two wounds in ant. wall stomach near large curvature 1 cm. distance between them; protusion of mucosa through wound; efforts of vomiting causes escape of liquid from stomach; margin of wound trimmed with scissors; two rows of sutures; posterior wall not examined. Operator: Schroeter. Result: recovery. Observations: on the 18th day two fragements of the projectile were found in the stools.

Case 98.—Wound: right side of linea alba. 4 cm. below proc. ensiformis. Time between injury and operation: 1½ hours. Lapar.; wound ant. wall and one post. wall stomach; stitched; bullet not found. Operator: N. Schumkin. Result: recovery. Observations: tentamen suicidii.

Case 99.—Male; 72 years. Wound: sixth intercostal, surrounded by emphysema. Time between injury and operation: four hours. Laparotomy; perf. stomach ant. wall level large curvature; perf. also post. wall. Profuse hemorrhage; suture; peritoneal toilette. Operator: Senn. Result: died on operating table. Autopsy: bullet had pierced pancreas and the vertebral canal.

Case 100.—Male; 28 years. Wound: inf. portion of fifth rib; no exit wound. Time between injury and operation: not indicated. Five mm. stomach hole; sutured; bullet and exit wound not found. Operator: Silbermann. Result: died.

Post mortem: a second hole in ant. wall stomach, a few mm. in diam.; bullet found at left of spinous apophysis of 12th cerv. vertebr. in muscular mass.

Case 101.—Boy; 15 years; rifle. Wound: one finger above and to left of umbilicus. Time between injury and operation: 32 hours. Lap.; stomach and liver penetrated; stomach contents out. Hemorrhage; suture; perit. toilette. Operator: Simmons. Result: recovery.

Case 102.—Male; 18 years; revolver. Wound: left hypochondrium. Time between injury and operation: not indicated. Lap.; double perf. stomach; blood and food in abd. cavity; suture. Operator: Sorge. Result: died 12 hours later. Autopsy: 12th intercostal artery severed.

Case 103.—Male; 27 years. Gun calibre: 32. Wound: between xyphoid and umbilicus, a little left of median line. Time between injury and operation: twelve hours. Laparotomy: escape of bloody serum from abd. cavity; two holes in stomach; three perf. in jejunum; mesocolon and pancreas also wounded causing profuse hemorrhage. Operator: Stimson. Result: died 1½ hours later. Autopsy: renal wound; no other visceral lesion.

Case 104.—Female; 27 years; revolver. Wound: left of linea alba; epigastrium. Time between injury and operation: 13 hours. Lap.; stomach-contents in abd. cavity; four perf. stomach wall; sutures. Operator, Syjanenin. Result: died 13 hours later. Autopsy: perf. ant. border liver; bullet found at 12th rib, near axillary line; general peritonitis.

Case 105.—Male; 24 years. Wound: 3 cm. outside of mammillary line on left side. Time between injury and operation: three hours. Laparotomy; perforation ant. wall of stomach, admitting two fingers; six grains of lead removed from stomach; suture of wound. Operator: Syjasenin. Result: recovery.

Case 106—Male; 24 years. Wound: sixth intercostal space 1½ fingers mammillary line, inner side. Time between injury and operation: three hours. Lapar.; wound admitting two fingers in ant. wall stomach; stitched; post. wall healthy. Operator: G. A. Swijasheninow. Result: recovery.

Case 107.—Woman; 23 years. Wound: epigastrum, left of linea alba. Time between injury and operation: 12 hours. Lapar.; four small openings in ant. wall stomach, near pylorus; suture; st. contents in abd. cavity; washed. Operator:

G. A. Swijasheninow. Result: died 12 hours later. Necropsy revealed also a perf. wound in ant. surface of liver.

Case 108.—Wound: on left costal arch. Time between injury and operation: not indicated. Senn's method proves gastric perforations. Lap. stomach two perf.; hole in duodenum; meso-colon and mesentery wounded. Operator: Taylor. Result: died 24 hours later. Observations: aut. peritonitis.

Case 109.—Female. Wound: 2½ fingers' breadth to right of antero-sup. iliac spine, and 4 fingers' breadth from median line; exit wound below umbilicus, 3 fingers' breadth from med. line. Time between injury and operation: 17 hours. Chloroform; pulse 136; supra-umbil. lap.; escape of gas, but no food in abd.; no visceral lesion discovered; abd. closed. Operator: Thorpe. Result: died 50 hours later of infection. Autopsy: stomach traversed just below pylorus, and at level of large curv.; one wound partially cicatrised; blood in abd.

Case 110.—Male; 39 years; pistol. Wound: 3 in. from middle line, 2 in. below margin of ribs. Time between injury and operation: 1½ hours. Lapar.; inc. over wound; epigastric artery ligatured; clots of fluid in abd. sponged away; two wounds stomach; exit wound in greater curv. under spleen; closed, silk Lembert sutures; right lobe liver pierced, bleeding; tampon; omentum injured; no other visceral lesion; abd. wound closed with drainage of liver wound. Operator: L. M. Tiffany. Result: recovery.

Case 111—Male; 22 years. Wound: fifth intercostal space a finger outside of mammillary line. Time between injury and operation: three hours. Lapar.; both walls stomach, left lobe liver perfor.; suture. Operator: Trachtenberg. Result: necropsy revealed penetrating wound in each of following left lower pulmonic lobe, diaphragm, posterosuperior portion of spleen seventh rib behind.

Case 112.—Female; 21 years; revolver. Wound: left of linea alba above xyphoid. Time between injury and operation: three hours. Autopsy: wall of stomach traversed from side to side; sutures. Compl.: perforations of ant. border of liver. Operator: Trachtenberg. Result: recovery; discharged in 40 days.

Case 113.—Male; 30 years; revolver; tentamen suicidii. Wound: intersection of seventh intercostal and mammillary lines; bullet left beneath skin at angulus scapulæ inferioris. Time between injury and operation: three hours. Laparot-

omy; stomach wounded from side to side; sutures; complic.; perf. ant. border of liver. Operator: Tranchtenberg. Result: died two days later. Autopsy: perf. inf. lobe left lung.

Case 114.—Age 13 years; Flobert rifle accident just after breakfast. Wound: midway between umbilicus and tip of sternum. Time between injury and operation: six hours. supra-umbilical lapar.; large quantity blood clots in perit. cavity; a large wound middle of ant. stomach wall; closed No. 1 catgut; button-hole wound edge left lobe liver; no other stomach wound; intest. searched, found three wounds of entrance and three of exit in ileum, about three feet above cecum; sutured each; three wounds mesentery also sutured; some hematomata in great omentum; abd. closed; drainage first 24 hours. Operator: Vance. Result: uneventful recovery in 16 days.

Case 115—Boy; 14 years; Flobert rifle accident. Time between injury and operation: six hours. Median supra-umbilical lapar.; ½ inc. wound ant. wall stomach stitched; six wounds in ileum about three feet above cecum; sutured lacerated wounds mesentery near border; abd. filled with fluid blood; continuous sutures for each wound; hot-water flushing abd. cavity; ext. wound closed with drainage. Note: some hematomata in small mesentery. Operator: Ap. M. Vance.

Case 116.—Male; 44 years. Gun calibre: 22. Wound: 2½ in. above umbilicus and 1½ inc. to left of median line. Time between injury and operation: one hour. Lapar.; inc. over wound; hole stomach closed No. 1 catgut interrupted Lembert sutures and a cont. Lembert over it; blood clots below liver; a lacerated wound near lower border of duodenum; sutures inter. Lembert; jejunum distended with blood; irrig. normal salt; abd. closed; gauze and glass drain. Operator: Vance. Result: recovery in 15 days.

Case 117.—Male. Gun calibre: 32. Time between injury and operation: seven hours. Lapar.; 2 perf. stomach; sutured. Operator: Major J. T. Vaughan reported by Capt. Flagg. Result: recovery.

Case 118.—Gun calibre: 32. Male. Time between injury and operation: not stated. Lapar.; 2 perf. stomach; closed. Operator: Major J. T. Vaughan, reported by Cap. Flagg. Result: recovery.

Case 119.—Male; 25 years; small calibre 41 mm. pistol. Wound: back 6 cm. to left of linea spinosa, beneath last rib;

bullet found embedded in muscles of ant. abd. wall, 5 cm. to left of median line and 2 cm. above umbilicus. Time between injury and operation: two and ½ hours. Left lateral laparotomy; ether narcosis; incision over ext. wound; second transverse incision; stomach-contents and blood flowing from abd. cavity; one perf. near large curv. in stomach another perf. near pylorus, both bleeding; closed by sutures. Complic.: five perf. and two contused wounds of intestines; ..turing of each. Time of operation: two hours. Operator: Vaughn. Result: died one hour later. Autopsy: pre-existing ascending pyelonephritis.

Case 120.—Male; 32 years. Wound: inner border of junction of costal cartilage of left seventh and eighth ribs. Time between injury and operation: five hours. Infra-umbilical median lap.; abd. cavity full of blood; one inch perf. ant. wall stomach, at middle of lesser curvature; post. wall perf., ½ inch, near pyloric orifice; both wounds ragged edges; perf. in right lobe of liver, from its under surface upwards and outwards; right pleura and lower lobe right lung, also perf.; prof. hemorrhage from liver wound; packed with iodoform gauze; transf. of normal salt; Lembert sutures for stomach wounds; abd. washed hot normal salt; liver drainage; external wound closed. Operator: G. W. Wagoner. Result: recovery.

Case 121.—Boy; 19 years. Wound: 3 cm. to right of middle line under false ribs. Time between injury and operation: 2½ hours. Explorat. lapar.; stomach perf. near pylorus, on level of small curvature; liver perf. from side to side, near ant. border, at level of suspens. lig.; escape of gastric contents; suture; hot water perit. wash; abd. closed. Operator: Willems, reported by Lambotte and Hermann. Result: died in a few hours. Autopsy: bullet had entered abd. aorta, lodging at branching of left iliac art. below celiac trunk.

Case 122—Boy; 16 years. Wound: 1 in. to right of umbil. and ½ inc. below. Time between injury and operation: four hours. Median lapar.; ragged, punctured wound, ant. wall stomach 2 inc. above lower border, 4 inc. from pylorus; during opr. escape of some liquid and gas; wound partly closed Lembert suture, walled off gauze; great omentum incised; lesser perit. cav. and post. st. wall examined; nothing found; wound in stomach enlarged to 1¾ inc. to empty stomach of 3 pints of odorless semisolid material; closed with three layers of interrupted Lembert; field flushed hot salt sol.; ext.

would excised; drainage gauze. Operator: H. Williams. Result: recovery in three weeks.

Case 123.—Male; 18 years; small pistol. Wound: epigastric region, left of costal margin. Time between injury and operation: one hour and ¼. Laparotomy; double perforation of stomach; entrance wound ant. wall, at equal distance from curvatures, two fingers above pylorus; exit wound at corresponding spot on post. wall; escape of blood and stomach-contents into peritoneal cavity. Operator: Wilson. Result: recovery.

Case 124.—Male; 58 years; accident; buckshot. Wound: hypochondr. region. Time between injury and operation: one hour. Lapar.; perf. ant. wall stomach; escape of gas, but of no other stomach-contents; Lembert sutures; no other lesion; abd. wound closed. Operator: R. Winslow. Result: recovery. Observations: operative bronchitis on fourth day.

Case 125.—Male; 25 years; pistol, 38 cal. Wound: below apex of heart. Time between injury and operation; not indicated. Supra-umbilical lapar.; ligature of gastro-epiploica sinistra; wound in stomach closed; carbolized silk Lembert sutures; post. wall wound near pylorus similarly closed; hot water Hgl. (1:2000), flushed abd. cavity; ext. wound closed with drainage. Time: 40 min. Operator: L. A. Woodson. Result: recovery.

Case 126.—Male; 19 years. Wound: between axillary and scapular line, 1½ inc. below pelvic bone. Time between injury and operation: four to five hours. Lapar.; two holes in stomach, two in colon asc. and two in colon desc.; sutures; tamponade; 24 hours later closure of abd. wound. Operator: Woolsay. Result: recovery.

Case 127.—Old Student; 14 years. Wound: bullet entered 10 cm. to left of umbilicus. Time between injury and operation: two hours. Lapar.; hole ant. wall stomach; none posteriorly; suture. Operator: Zawadski.

Case 128.—Male; 32 years; 7 mm. pistol; duel. Wound: left hypochondrium, two fingers from costal arch; exit wound in seventh intercostal space, two left of ant. axillary line. Time between injury and operation: five hours. Laparotomy; one wound three fingers' breadth from large curvature of stomach, second hole 5-6 cm. from first, both in anterior wall; stomach distended; for wounds two rows continuous sutures; Mikulicz drainage; spleen wounded. Operator: Zimmer. Result: died on seventh day. Post mortem: hemorrhage from

wound in post. part of spleen; one litre of blood in thorax; hematoma beneath left lobe of liver; perforation of diaphragm and wounding of left lower pulmonic lobe.

Case 129.—Male; 25 years; revolver, 32 cal. Wound: one cm. left of umbilicus; bullet under skin at seventh intercostal and axillary lines. Time between injury and operation: three hours. Oper.; small curv. stomach perf. 8 cm. above pylorus; four Lembert sutures; three cont. wound ant. wall near small curv. of which one on point of insertion of gastrohepatic lig.; suture; ligature of pyloric artery; food in perit. cavity; drainage. Time: two hours. Complic.: liver penetr. near hilus and traversed in dir. of seventh interspace. Operator: Bernays. Result: recovery in 34 days.

Case 130.—Male; 28 years; revolver, 8 mm. Wound: two wounds at level of xyphoid. Time between injury and operation: two hours. Lap.; ant. stomach wall perforated; no stomach-contents in abd. cavity; suture; periton. toilette. Compl.: liver wounded. Operator: Bertram. Result: recovery.

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THE EFFECTS OF OSMIC ACID INJECTIONS

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Billroth and Neuber (Lancet, 1885, Vol. 1, p. 1096) were the first to employ osmic acid for neuralgia They used repeated injections by puncture through the skin without exposure of the nerve As many as twenty injections were given in some cases.

Eulenburg (Lancet, 1884, Vol. I, p. 443) employing a similar method, had good results in only three out of thirteen cases, which included neuralgias of the brachial, sciatic, and trigeminal nerves.

Schapiro (Lancet, 1885, Vol. I, p. 1096), who used a 1 per cent solution of osmic acid in glycerine and water, records five successes out of eight cases at periods of two to six months after injection.

Jacoby (Lancet, 1885, Vol. II) claims eight cases of cure out of eighteen sciaticas, and warns us that it is "dangerous to implicate a motor nerve."

Cohen (Practitioner, 1889, Vol II, p. 373), of Philadelphia, used repeated injections (without exposure) into the sciatic nerve, using as much as 30 minims of a 1 per cent solution.

Ellis (Lancet, 1885, Vol. II) records the occurrence of some irritation after injection into a thumb in which pain followed a sprain.

Mercer (Lancet, 1885, Vol. I, p. 58) injected deeply and repeatedly into the sciatic region with temporary relief and no ill effects.

Franck (Year Book of Treatment, 1898, p. 76) obtained three successes by direct injection.

Turner (Med. Soc. Trans., 1898, p. 357) records a case of trigeminal neuralgia of two years' standing

in which he injected into infra-orbital and after ten days relief followed, lasting six months, i. e., to the date when the patient was last seen.

Wright (The Medical Chronicle, Manchester, 1903-1904, pages 291 to 300) claims that most surgeons who have used osmic acid have injected it more or less at random without exposing the nerve trunk. He further states that such a method is quite sufficient to account for irregular and defective results and that it is also remarkable that so little is said of any ill effects, considering the very marked changes that osmic acid produces in the tissues, as shown experimentally by Frankel and seen by himself in a case which he injected and which, on removal of a portion of muscle which had been attacked by the acid, showed marked degenerative myositis.

Wright had exposed the nerve in all his cases and had injected a one and five-tenths to two percent watery solution into the trunk or into branches. Sometimes the injection had been both toward the periphery and toward the center, and the acid had generally escaped more or less freely into the tissues immediately around the nerve. Most of this author's cases were much too recent to justify a conclusion as to the permanent value of the method. He contends that it is impossible to eliminate the effect of the exposure, and the mechanical results of manipulation and puncture of the nerve and of occasional unintentional section by the trephine.

He deems it clear that if this method is employed, the nerve should be fully exposed and not merely a chance injection made through the skin. Immediate results in his cases, as regards both harmlessness and at least temporary relief, quite justify the use of the plan before resorting to any such severe procedure as excision of the Gasserian ganglion. He preferred to expose and inject the trunk in some cases rather than to deal with the terminals only, and this is a matter

that should be settled, since the severity of the one procedure is of course much greater than that of the other. It is also of importance to remember that delay in relief may occur, i. e., that pain may continue for some days or even longer after the injection and then pass off, so that it is not necessary to assume failure or to repeat the operation until time has been given to make sure that it is necessary.

Wright (*ibid*) reports a case of a male, aged 33, who suffered for three years with pain in the testes. The right testis was removed, after which pain persisted in the left testis and cord. Osmic acid was injected into the tissues of the cord with improvement.

In another case, that of a male, aged 31, a postman, there was pain in the left heel interfering with walking. The posterior tibial nerve was injected with osmic acid. The result was a failure. Wright several times injected the lingual and inferior dental nerves, after trephining the lower jaw, with indifferent results. In the majority of these cases there was return of pain after, at most, a few months. He secured temporary relief by injecting a 2 per cent solution of osmic acid into the auriculotemporal nerve.

Up to November 4, 1899, W. H. Bennett (Lancet, November 4, 1899) had treated twelve cases of neuralgia, involving various nerve trunks, by injections of a 1 per cent solution, using ten to twelve minims for each nerve trunk. The symptoms were relieved in a few hours, and in all cases the cure seemed to be complete. In Bennett's cases, the median, popliteal, peroneal, and the branches of the trigeminal nerve were injected. Bennett believes that the results will be better if the injections of osmic acid be applied early in the course of the disease.

In a personal letter to Dr. J. B. Murphy (Jour. A. M. A., October 8, 1904), Bennett reviews eight additional cases, making twenty in all. Of these twenty cases,

eighteen experienced complete relief. The time elapsing between operation and report, however, was, it should be noted, in several cases quite short.

Murphy (Journal A. M. A., October 8, 1904, p. 1056) reported fourteen cases in which osmic acid was injected in a 1 per cent to 2 per cent solution into the nerve trunks for neuralgia. He found that the injections relieved the pain immediately and for a long period of time. He advised against injection into the superficial tissue for peripheral neuralgia, as the nerve trunks were easily located. He advised also against injection into a motor nerve or a motor nerve area, and, therefore, never into a spinal nerve, except in amputation stumps. Murphy found local necrosis of tissue about the injected nerve, and even the wall of the foramen showed necrotic changes. The necrosis did not suppurate except in cases exposed to marked infection.

In tic douloureux he advocates injection into all branches, including the palatine, lingual, mandibular, supra-orbital, and infra-orbital. He calls attention to the fact that there may be two or three divisions of the supra-orbital, and that each should be searched for and injected separately. He advises the use of a general anesthetic.

Judging theoretically from experience in resections and ganglion operations, Murphy believes that the relief will not be permanent after the injection of osmic acid. Clinical experience up to date, however, particularly the experience of Mr. Bennett and himself, leads him to believe that many cases are really permanently cured. While he admits that time alone can determine the final results, he commends the injection of osmic acid because of its ease of application, its nil mortality, and its immediate results.

Murphy reports no injections of osmic acid for conditions other than tic douloureux. In these cases,

he injected osmic acid in a solution of 1 to 2 per cent, ten minims into each trunk.

AUTHOR'S CASES

The author has injected osmic acid for neuralgia eleven times in nine patients, as follows:

CASE I.

History.—Mrs. W., aged 71, was first seen on July 12, 1904. The case was one of typical intense tic douloureux involving the right side of the face. The first paroxysm occurred about ten years previously, subsequent attacks gradually becoming more frequent and more severe. Practically all of the many remedies recommended for the relief of this condition had been tried without benefit. For almost three months prior to the operation, the pain had been excruciating, the attacks occurring with exhausting frequency. The whole right side of the face was exquisitely tender, particularly in the neighborhood of the infra-orbital and mental foramina. The tongue was sore and tender at all times, this greatly interfering with speech. During attacks the pain was most acute about the right angle of the mouth and the angle of the right jaw. Violent spasm of the buccinator was almost constantly present during the attacks.

Treatment.—A 2 per cent solution of osmic acid was injected into the supra-orbital, infra-orbital, and inferior dental nerves at the supra-orbital notch and infra-orbital and mental foramina. The manner of operation was that practiced by Dr. Murphy. Ten drops of a 2 per cent solution of the osmic acid were injected into each branch, and two or three drops were forced into the perineural fat of each foramen around the nerve. At the time of the injection of the osmic acid, the nerves were drawn, with very slight force, from the foramina, and held during the injection, but the trunks were not stretched as in the operation of neurectasy.

Result.—Up to the present time there has been no return of the pain since its abatement one week after the operation. During the first week, several rather severe paroxysms occurred, these gradually decreasing in severity.

An interesting feature of the case was the nephritis occasioned by the elimination of the acid. The urine passed during the first twelve hours succeeding the operation, showed nothing unusual; however, on the second day nephritis resulted. There were no symptoms, either subjective or objective, pointing to its onset or presence, excepting the appearance of and findings in the urine. The patient did not complain of pain in the loins. Urine passed thirty-six hours after the operation showed the following:

Reaction, very slightly acid; sp. gr., 1036; color, dark claret. The specimen was centrifuged, and the sediment composed a little over a quarter of the volume. The clear fluid above the sediment was light-claret in color, the sediment being dark-red. Examination of the fluid portion showed a small amount of albumin with no sugar, bile, or other abnormal substance present. Examination of the sediment showed it to be composed almost entirely of red-blood cells. There were no casts, epithelial cells, or pus cells. The red-blood cells disappeared from the urine on the fourth day.

CASE 2

History.—Miss L., aged 22, had suffered pain, paroxysmal in character, for four or five years. Only the area supplied by the inferior dental branch was involved. Paroxysms had increased in frequency during the few weeks before operation, until the pain was almost continuous and the region of the lower jaw on the right side was very tender.

Treatment.—On October 10, 1904, ten drops of a 2 per cent solution of osmic acid were injected into

the trunk of the inferior dental nerve at the mental foramen, and a few drops were forced into the perineural fat around the nerve.

Result.—Pain persisted for two weeks after injection and then abated, and, up to the present time, has not returned.

CASE 3

History.—Mr. B., aged 27, had sharp pain for 18 months in the area supplied by the supra-orbital and auriculotemporal branches. The superior maxillary and inferior dental trunks were not involved.

Treatment.—Open operation was refused, and twenty drops of a 2 per cent solution of osmic acid were injected subcutaneously along the course of the trunk and branches of the auriculotemporal nerve. Ten drops of a 2 per cent solution were also injected at the supra-orbital notch.

Result.—There was almost complete relief from pain for a period of two months, after which the pain recurred, somewhat reduced in severity.

CASE 4

History.—Mrs. S., aged 41, had had violent pain in the area supplied by the inferior dental and infra-orbital branches for eight years, the paroxysms gradually increasing in severity and in frequency.

Treatment.—On February 15, 1905, ten drops of a 2 per cent solution of osmic acid were injected into the two involved trunks at their respective foramina.

Result.—Pain persisted in both regions, without much abatement, for ten days, after which it gradually disappeared, and had not returned when the patient died, three months later of cerebral hemorrhage. There was no autopsy.

CASE 5

History.—Mrs. H., aged 71 years, exhibited intense tic douloureux, involving the right side of the face, the first attack having occurred twenty years previous-

ly, subsequent attacks gradually increasing in severity and in frequency.

Treatment.—On July 5, 1904, a 2 per cent solution of osmic acid was injected into the supra-orbital, infra-orbital, and inferior dental nerves at their respective superficial foramina of exit. Ten drops of a 2 per cent solution were injected into each branch and a few drops spilled upon the perineural fat.

Result.—The pain persisted for two weeks, after which it abated and did not reappear until the following July, one year later, at which time the pain appeared in the area supplied by the inferior dental branch only. Under cocaine anesthesia, ten drops of a 2 per cent solution of osmic acid were now introduced through a hypodermic needle directly into the large mental foramen without incision, with the result that the pain disappeared for ten days, at the end of which time it reappeared in this branch. An incision was then made, and the trunk injected, the pain continuing for one week, after which it practically ceased. The last operation was done in this case on July 25, 1905.

CASE 6

History.—Mr. J., aged 55, had suffered for about ten years with sciatic neuralgia, and had tried all the more common medicinal methods of treatment of this disease.

Treatment.—Osmic acid in a 2 per cent solution was injected upon two occasions, one month apart, subcutaneously at three points along the course of the sciatic nerve.

Result.—Each time there was slight temporary benefit. The effect was no more pronounced and no more lasting than that which had been produced by injections of thein in two-grain doses in a similar manner in the same case.

CASE 7

History.—Mrs. C., aged 35, suffered with neuralgia,

implicating the infra-orbital and auriculotemporal branches.

Treatment.—On March 12, 1904, osmic acid in a 2 per cent solution was injected, ten drops over the infra-orbital foramen and ten drops subcutaneously in the area supplied by the auriculotemporal nerve.

Result.—Partial relief, lasting to the present time.

Cases 8 and 9 were simple injections of osmic acid, 2 per cent solution under cocaine anesthesia. The injection in each instance was into the infra-orbital and mental foramina. The results were unsatisfactory.

CHANGES PRODUCED IN THE TISSUES BY OSMIC ACID

Frankel, of Hamburg (Practitioner, 1885, Vol. I, p. 45), found experimentally in animals destruction of axis cylinders and degeneration of white substance with epineuritis and myositis as the result of his injections.

Murphy found on microscopic examination the most important changes at and distal to the point of injection. The degree of pathologic alteration varied to a considerable extent, dependent on the thoroughness of the injection and whether infection had resulted. At the point of injection there was always more or less staining of the perineural and interstitial fat with the osmic acid. There was little marked derangement of the fibers. The inflammatory reaction was always less extensive than might naturally be expected. An occasional area of focal necrosis, a few foci of round-cell infiltration, and here and there a leucocyte, attracted thither by the foreign substance, were all that was to be noted.

Distal to the point of injection the nerve trunk in some cases, seemed atrophic, but there were no interstitial changes. Proximally, no changes were to be found except in the immediate vicinity of the injection. At and distal to the point of injection, there was more or less extensive fatty degeneration of the myelin

sheath. This varied in amount from the involvement of all the fibers to degeneration of an occasional fiber only. Proximally the myelin sheath was unaffected, except immediately above the limit of blackening, which was the means of defining the extent of the infected area.

INVESTIGATION INTO THE NATURE OF THE TISSUE CHANGES PRODUCED BY OSMIC ACID

(Made under the Author's direction by Dr. Everett E. Padgett)

Experiment I.—Adult Rabbit

April 2d.—Injected into deep tissues of left hind leg five drops of a 2 per cent solution of osmic acid freshly prepared. Rabbit allowed to go free ten days. No paralysis developed. No clinical changes.

April 13th.—Exposed left sciatic nerve and injected five drops of a 2 per cent solution osmic acid directly into substance of nerve. Nerve and surrounding structures blackened. Skin incision closed with catgut sutures.

April 15th.—Paralysis developed which continued until rabbit was killed.

April 26th.—Rabbit chloroformed.

Experiment II.—Puppy Four Months Old

August 13th.—Injected left sciatic nerve with a 2 per cent solution freshly prepared osmic acid. Five drops injected with very little loss of acid into surrounding structures. Nerve at once blackened by acid. Suture closed by catgut.

August 15th.—Paralysis developed. Dog carried foot.

August 18th.—Paralysis improved.

August 20th.—Paralysis practically disappeared. Nutrition good.

August 20th.—Dog killed by chloroform.

EXPERIMENT III.—SMALL RABBIT THREE MONTHS OLD

August 14th.—Injected both sciatic nerves with a 2 per cent solution of osmic acid, using five drops to each nerve. Some acid lost in surrounding tissues. Nerves and surrounding tissues blackened by acid at time of injection.

August 15th.—Paralysis of both legs.

August 17th.—Continued paralysis. Rabbit dragged legs. Nutrition poor.

August 18th.—Rabbit died with paralysis persistent. Wounds not infected.

EXPERIMENT IV.—ADULT RABBIT

August 14th.—Left sciatic nerve injected with 2 per cent solution osmic acid. Nerve and surrounding tissues blackened.

August 16th.—Paralysis developed.

August 18th.—Paralysis continued. Sutures catgut still in situ. Wound infected.

August 20th.—Rabbit killed by chloroform.

EXPERIMENT V.—LARGE RABBIT

August 13th.—Injected both left sciatic nerves and cords of right brachial plexus with 2 per cent solution osmic acid, using five drops in each injection. Skin sutured with catgut.

August 15th.—Developed slight paralysis of left hind leg, which improved before rabbit was killed. No paralysis in fore leg.

August 20th.—Rabbit killed by chloroform.

EXPERIMENT VI.—LARGE RABBIT

August 20th.—Injected both sciatic nerves and also deep muscles of fore leg with 2 per cent solution osmic acid. Wounds closed with catgut.

August 23rd.—Paralysis of both hind legs. Wound on left hind leg infected.

Post Mortem, Gross and Microscopical Examination

Parts of tissue were removed from the various organs and stained after the following methods:

A. General Stains—

1. Hematoxylin and eosin, the eosin being very heavy.
2. Borax carmine.
3. Van Giesen.

B. Special Stains—

1. Nerves.
   a. Myelin sheath stains.
      1. Paul Weigert's.
   b. Stain for neuralgia fibers.
      1. Phosphotungstic acid hematoxylin.

Experiment I.—Gross Anatomic Findings

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Size	Diminished in caliber	Diminished	Diminished
b. Color	Very dark	Gradually becomes lighter	Gradually becomes lighter
c. Consistency	Softer than normal	Softer than normal	Softer than normal

2. Surrounding tissues.

	At site of injection	Proximal	Distal
a. Color	Dark brown	Shading to normal	Shading to normal
b. Infection	Absent	Absent	Absent
c. Inflammatory nodules	Present	Present	Present

3. Other organs.
   a. Voluntary muscle, inflamed.
   b. Heart, normal.
   c. Liver, normal.
   d. Lungs, normal.
   e. Spleen, normal.

II. Microscopic Findings.

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Perineural fat	Stained	Stained	Stained
b. Axis cylinder	Normal	Normal	Normal
c. Myelin sheath	Degenerated	Degenerated	Degenerated
d. Nodes of Ranvier	Stain less plainly	Less clear	Less clear
e. Caliber	Diminished	Diminished	Diminished
f. Focal necrosis	Present	Present	Present
g. Staining quality	Less than normal	Less than normal	Less than normal

2. Heart.
   a. Myositis.
   b. Round-celled infiltration.
3. Liver.
   a. Normal.
4. Spleen.
   a. Normal.
5. Muscles about site of injection.
   a. Inflammatory changes.

EXPERIMENT II.—GROSS ANATOMIC FINDINGS

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Size	Diminished in caliber	Diminished in caliber	Diminished in caliber
b. Color	Very dark	Lighter in color	Lighter
c. Consistency	Softer than normal	Softer	Softer

2. Surrounding tissues.

a. Color	Dark brown	Shading to normal	Shading to normal
b. Infection	Absent	Absent	Absent
c. Inflammatory thickening	Absent	Absent	Absent

3. Other organs.
   a. Voluntary muscles, inflamed.
   b. Heart, myositis.
   c. Liver, normal.

II. Microscopic Findings.

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Perineural fat	Stained	Stained	Stained
b. Fibers	Normal	Normal	Normal
c. Myelin sheath degeneration	Slight	Slight	Slight
d. Nodes of Ranvier	Stain poorly	Stain poorly	Stain poorly
e. Caliber	Diminished	Diminished	Diminished
f. Focal necrosis	Very slight	Very slight	Very slight
g. Staining qualities	Less than normal	Less than normal	Less than normal

2. Heart, myositis.

3. Liver, normal.

4. Muscle at site of injection.

   a. Inflammatory changes.

5. Striated muscle of opposite leg, normal.

Experiment IV.—Young Rabbit

Gross Anatomical Findings.

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Size	Diminished	Diminished	Diminished
b. Color	Very dark	Lighter	Lighter
c. Consistency	Softer than normal	Softer than normal	Softer than normal

2. Surrounding tissues.

	At site of injection	Proximal	Distal
a. Color	Dark brown	Lighter	Lighter
b. Infection	Present	Present	Present
c. Inflammatory exudate	Present	Absent	Absent

3. Other organs.

   a. Heart, normal.

   b. Liver, normal.

   c. Spleen, normal.

II. Microscopic Findings.

1. Nerve, left sciatic.

	At site of injection	Proximal	Distal
a. Perineural fat	Stained	Stained	Stained
b. Axis cylinder	Normal	Normal	Normal
c. Nodes of Ranvier	Stain less plainly	Stain less plainly	Stain less plainly
d. Caliber	Diminished	Diminished	Diminished
e. Focal necrosis	Absent	Absent	Absent
f. Staining quality	Less than normal	Less than normal	Less than normal

2. Heart.

a. Myositis.

3. Liver.

a. Normal.

4. Muscle at site of injection.

4. Degenerated.

Experiment V.—Large Rabbit

Gross Anatomical Findings.

I. Gross.

1. Nerve, brachial plexus.

	At site of injection	Proximal	Distal
a. Size	Diminished in caliber	Diminished in caliber	Diminished in caliber
b. Color	Very dark	Becoming lighter	Becoming lighter
c. Consistency	Softer than normal	Softer than normal	Softer than normal

2. Surrounding tissues.

	At site of injection	Proximal	Distal
a. Color	Dark brown	Disappearing	Disappearing
b. Infection	Absent	Absent	Absent
c. Inflammatory exudate	Present	Present	Present

3. Other organs.

a. Heart, myositis.

b. Liver, normal.

c. Lungs, normal.

d. Other muscles, normal.

II. Microscopic Findings.

1. Nerve, brachial plexus.

	At site of injection	Proximal	Distal
a. Perineural fat	Stained	Stained	Stained
b. Axis cylinder	Normal	Normal	Normal
c. Nodes of Ranvier	Stain less plainly	Stain less plainly	Stain less plainly
d. Caliber	Diminished	Diminished	Diminished
e. Staining quality	Less than normal	Less than normal	Less than normal

2. Heart, myositis.

3. Liver, normal.

4. Muscles about site of injection.

a. Inflammatory changes.

EXPERIMENT V.—LARGE RABBIT

Necrospy, August 29th.—Had injected both sciatic nerves and deep structures of fore leg.

Gross Anatomical Findings.

1. Nerves, both sciatic.

	At site of injection	Proximal	Distal
a. Size	Diminished in caliber	Diminished in caliber	Diminished in caliber
b. Color	Very dark	Lighter	Lighter
c. Consistency	Softer than normal	Softer than normal	Softer than normal

2. Surrounding tissues.

	At site of injection	Proximal	Distal
a. Color	Dark brown	Disappearing	Disappearing
b. Infection	Present	Present	Present

3. Other organs:

a. Voluntary muscles.

1. Inflamed.

b. Heart.

1. Myositis.

c. Liver.

1. Normal.

d. Spleen.

1. Normal.

e. Brain.

1. Corpora quadrigemina.

a. Normal.

2. Cerebral cortex.

a. Normal.

3. Medulla oblongata.

a. Normal.

4. Deep structures of fore leg.

a. Color, very dark, involving:

1. Muscle tissues.
2. Tendons.
3. Ligaments.
4. Periosteum.

b. Infection absent.

c. Inflammatory changes, absent.

II. Microscopic Findings

1. Nerves, both sciatics.

	At site of injection	Proximal	Distal
a. Perineural fat	Stained	Stained	Stained
b. Axis cylinder	Normal	Normal	Normal
c. Myelin sheath	Stains poorly	Stains poorly	Stains poorly
d. Caliber	Diminished	Diminished	Diminished
e. Focal necrosis	Focal necrosis	Focal necrosis	Focal necrosis
f. Staining quality	Less than normal	Less than normal	Less than normal

2. Other organs:

a. Brain.

1. Corpora quadrigemina.

a. Normal.

2. Medulla oblongata.

a. Normal.

3. Cerebral cortex.

a. Normal.

b. Heart.

a. Normal.

d. Muscles at seat of deep injection:
   a. Color, tissues dark
   b. Nuclei, clearly visible.
   c. Sheath of muscle fibers, visible.
   d. Protoplasm, stains poorly; unable to make out different parts.
   e. Inflammatory changes, present.
e. Tendons.
   a. Inflammatory changes.

CONCLUSIONS

1. The injection of ten drops of osmic acid in a 2 per cent solution into sensory nerve trunks is safe. The likelihood of irritation of the kidney, however, should not be forgotten in cases exhibiting kidney lesions. It is not probable that the death from cerebral hemorrhage three months after injection of the acid was due in any sense to the injection.

2. Injections into the inferior dental or other nerves should not be made through the mouth, since infection of the wound and necrosis may result, with consequent failure in the action of the acid.

3. Immediate relief should not always be expected, notwithstanding the cases of Bennett and Murphy were all immediately relieved. No one of the writer's cases, even those in which the acid was accurately injected into the nerve trunks and into the perineural fat, was promptly relieved, relief coming in from one to two weeks. The observations on this point of Wright (*ibid*), who had a large experience with osmic acid injections, correspond with those of the writer.

4. There is very little doubt but that the stretching of the nerve trunk necessarily incident to the injection is productive of good, supplementing, as it does, the action of the acid. There is, therefore, no good reason why the stretching should intentionally be avoided, except, perhaps, for experimentation.

5. In the case of small nerves, it will be found ex-

ceedingly difficult to inject directly into the nerve trunk that is, the needle eye will pass to the distal side of the thread-like nerve, or perhaps not enter the nerve substance at all, or, notwithstanding the utmost care be used, the fibers may be so teased apart by the needle-point that the fluid will simply be spilt about the nerve. In such a case, in order to bring the acid into contact with all of the fibers, it is wise to clip the nerve so that the end may be bathed in the fluid.

6. The effect of manipulation of the nerve, as by stretching, has not as yet been eliminated as a possible aid to the chemical action of osmic acid, therefore a general anesthesia should be administered, so that neurectasy or section of the nerve may be practiced, if desired.

7. The writer's experiments have shown no other changes in the nerve tissues as the result of injections of osmic acid than the disintegration of fat and oil globules in the perineural space and in the white matter of Schwann, such white matter of Schwann being simply fatty matter in a fluid state insulating and protecting the essential part of the nerve. The degenerations appearing in the nerve itself are only such as may be fairly attributed to nutritional changes and exposure, the indirect result of the selective action of osmic acid of destroying fat. There is no reason why this fat should not be restored and the nerve again become capable of transmitting sensation; that is, theoretically, the neuralgia may return after injections of osmic acid.

8. Osmic acid injections are uncertain in effect as to the cure or relief or neuralgia.

9. A large percentage of cases of neuralgia will be relieved for months by osmic acid injections into the nerve trunk.

10. The injection of osmic acid for the relief of tic douloureux is quite justifiable, even if it should become necessary to repeat the injections at intervals of

a few months, particularly in view of the unfavorable results of these so-called radical operations.

11. The local irritation produced by the acid and the remote toxic and irritant effects are not serious in their consequences and have no meaning as to the effect of the osmic acid in relieving neuralgia.

12. The solution of osmic acid should be made fresh for each operation, as deterioration is rapid.

13. Pain persisting several days in a small circumscribed area, means that the filaments supplying this area have not been acted upon by the acid. The acid usually finally destroys such filaments. It may, however, become necessary to reopen a wound for the purpose of injecting such filaments.

14. Mere subcutaneous injections are of little or no value.

DISCUSSION

Dr. Jabez N. Jackson, of Kansas City, Mo.—Personally, I have used osmic acid injections in six cases of trifacial neuralgia. I have not heard from four of the patients since, so I have supposed they have been relieved. The longest of the cases probably is two and a half years; or, to put it another way, the patient received the osmic acid injections shortly after Murphy's article appeared in the Journal of the American Medical Association. Out of six cases, therefore, two patients have been subsequently heard from. One of the patients had bilateral tic and neuralgia of the infra-orbital and mental divisions; therefore, all four of these nerves were exposed and injected with osmic acid. Six months after the operation pain had recurred on one side, and the physician in charge of the case wrote and asked me for the solution of osmic acid so that he could inject it, although the other side has remained free from pain. I asked him to let me know the subsequent results, but have heard nothing further from him up to this time. Of the other case of which I have heard, the patient came to me again about a week ago. I operated a second time. There was no recurrence of pain in the infra-orbital branch, but he said he did have some pain along the gums and lingual branch. In this case I wish to report making a second exploration to see what the osmic acid had done at the previous operation. In exposing the mental fora-

men no nerve was discovered whatever, although the nerve had not been cut. I made an incision a little to the outer side of the foramen so as to expose the nerve, but could not find a vestige of the nerve at the aperture of the mental foramen. I cut down upon the lingual nerve, which I had injected, and could not find it. There was no vestige of the mental end of the nerve.

In the two last cases I have made use of a stronger solution, a five per cent solution, and I have had no unfavorable results whatever from the action of the osmic acid on the tissues. In every one of these cases the wound has healed promptly by primary union.

My experience agrees with that of Dr. Eastman, that the relief of pain has not, in most cases, been immediate. Sometimes is has been two days, sometimes three days, and as long as two weeks after operation before pain has disappeared. In all cases there has been relief of pain which was complete, as long as six months. Two of the six cases had recurrence of pain after that length of time. The other four I have not heard from, and do not know what the result has been in those.

Dr. W. D. Haines, of Cincinnati, Ohio.—Most of my experience with osmic acid injections has been confined to the treatment of sciatica, and I think about one-half of them, to give a rough estimate, have been relieved. The others have been afforded no relief.

About a year ago in attempting to treat a case we had great difficulty in obtaining osmic acid. The gentleman who referred the case to me was a classmate, and said, after we had tried for a week to obtain the drug, "Do you not recall that Dr. Kebbler, twenty-five years ago, advised the use of plain water injections in these cases?" I did recall it at that time, and we used sterilized water in this case, and it worked finely. The woman had complete relief, and has had no recurrence of the sciatica since. I have therefore been using sterilized water in these cases since. I believe the idea is this: If you get relief, it is due to pressure upon the axis cylinder, nerve-blocking. Of course, we use an entire barrelful of an ordinary syringe, sixty or eighty minims of sterilized water.

Dr. D. S. Fairchild, of Des Moines, Iowa.—A very interesting question comes up in connection with Dr. Eastman's paper, whether the nerve regenerates or not. Dr. Eastman can tell us what his observations have been as to the regeneration of the nerve. Of course, we understand that relief from osmic acid injections lies in the fact that the treatment pro-

duces degenerative changes in the axis cylinder. Now, if the nerve regenerates, the treatment is temporary in its effects.

DR. EASTMAN (closing the discussion).—It is rather strange that Dr. Jackson found that the nerve had not regenerated itself. We re-operated upon a case one year after the first injection of osmic acid, exposing the infra-orbital and inferior dental branches, and we found more nerve-tissue there after a year than was present at the time of the first operation. The nerve was quite regenerated to decidedly swollen. We clipped off the nerve at each foramen and found neuritis and epineuritis in each branch. Of course, one observation of that kind does not amount to very much. We did not find any marked degenerative changes. I have never seen real degeneration of nerve fiber following osmic acid injections.

Dr. Haines made a mistake in injecting osmic acid for the relief of sciatica. I am willing to agree with him that osmic acid can do absolutely no good in sciatica. Admitted that it can do no good, it may do a great deal of harm, because you can readily paralyze the hind leg of a dog by injecting osmic acid into the sciatic nerve. You can produce loss of function in the hind leg of a dog by injecting a weak solution of osmic acid even into this motor nerve area. It is therefore dangerous to inject osmic acid for sciatic neuralgia.

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